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CAPPING OF EXPOSED NERVE-PULPS.

(*One of the Simplest Operations in Dentistry.*)

BY J. N. FARRAR, M. D., BROOKLYN, N. Y.

Although the successful capping of an exposed nerve-pulp is not now considered by most dentists so great a victory as in former times, yet there are still some members of the profession who continue to ask the almost stereotyped question: "How can an exposed nerve-pulp be successfully treated?" Such people appear to be ignorant of the fact that the capping of pulps, if done properly, is among the simplest operations in dentistry.

Without pretending to offer anything particularly new upon the subject, I take pride in saying that there is enough old stock of information, especially in regard to materials, if properly applied, to enable any person of ordinary skill to perform this operation, not only successfully—say in ninety-nine cases in a hundred, and without causing much, if any pain—but it can be done with the greatest facility and rapidity. In fact, there is no plugging operation more simple, if carefully performed with proper appliances. To show how this may be done is the object of this paper.

There are a very few cases of exposed nerve-pulps so far degenerated and diseased that it is impossible to reinstate them. Such pulps follow but one course, whose destination is sooner or later death; but where to draw the dividing line, so that we may feel positive as to which side the more doubtful cases belong, can only be learned, approximately, from experience; and the more mature the judgment exercised in discriminating between those that are amenable to cure and those that are not, the greater will be the per cent. of success. Again: there are now and then cases which may be saved by great care on small chances, though perhaps in a sickly condition. Such cases may do to experiment upon, but I question whether it pays the operator or patient to "always attempt" to do so. Patients generally do not care to be experimented upon, and then suffer from the consequences.

Although I do not find use for arsenic more than four or six times a year, I am not one of those who say they "have thrown the bottle away." In its proper place it is valuable. I think it is about as absurd to say that every pulp can be preserved alive, as it would be for a physician to say that the life of every patient can be saved. "Common sense" is an excellent thing to treat exposed pulps with.

There are three principal conditions under which so called exposed pulps are found: those exposed by accident from causes without, such as by a drill; those that have become entirely exposed at some place, caused by caries; and those which are still covered with vestiges of decalcified dentine. Of course cases like the last-mentioned are not strictly in an exposed condition; yet they are so nearly so, that they require the same treatment. As all of these conditions, when the pulp is not too near the sepulchre, may be successfully treated by the same process, an explanation of the second variety—the one that is the most difficult—will be all that is necessary.

There are two or three principal methods of capping pulps in vogue, which are more or less successful, but I will only dwell upon the one which, to my mind, is as scientific as any, if not the most so.

Notwithstanding it is contrary to some "high authorities," I do not think it proper under, any circumstances, to apply an irritant,

like oxychloride of zinc, directly upon an exposed pulp. To do so is, in my judgment, not only barbarous to the patient, but unnecessary and unscientific, causing needless pain, and sometimes death of the pulp, and *perhaps* abscess; though it does not necessarily follow that the death of the pulp will always lead to abscess, or even occasion pain.

For a flooring to the cavity in the tooth, and a roof to the crown portion of the nerve-pulp, there is no material equal to nature's own (as advocated years ago*), viz., the dentine; though it may be decalcified, and even somewhat further degenerated, provided it be rendered antiseptic, so that it will not further decompose.

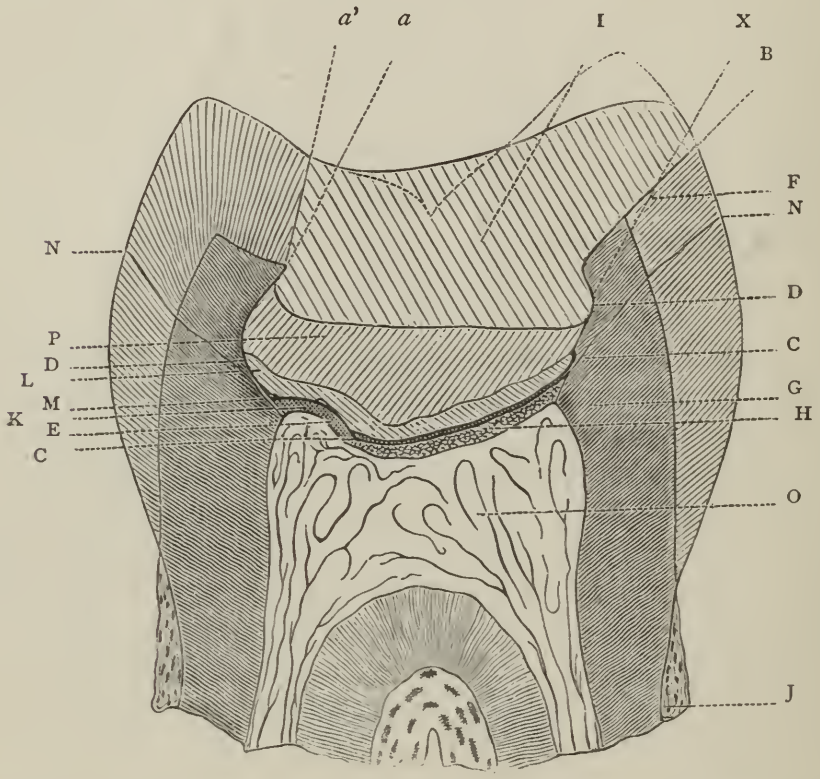
After proper preparation of the cavity, carefully preserving intact as much of nature's covering as is useful, it should be saturated with a mixture of wood creosote and morphia. My method of applying it is by forcing it from a screw syringe, using for this purpose a one-sixteenth inch nozzle. This size of aperture is necessary to allow the passage of the morphia, which is undissolved. Wood creosote is preferable, because it is practically a non-escharotic, and does not destroy the tissue of the living pulp as the escharotic creosote (so-called) will certainly do. There are in vogue fine-spun, hypothetical notions in support of the practice of producing a "scab-coat or film upon the surface of the pulp by the escharotic action of the oxychloride of zinc, in order to protect the remainder of the pulp from the superincumbent filling material." This is about as absurd as the act of the boy who cut off the toe of his stocking to mend the heel in order to shelter that part of his foot.

Creosote will not only destroy the life of all foreign organisms that may be present in the degenerated dentine, but it also will preserve the decalcified dentine from farther degeneration. Having thus rendered this dentinal floor of the cavity antiseptic, we may place a thin flooring of non-irritant plastic material over it, covering also any portion of the pulp that may by chance be exposed. But as all "non-irritant" capping compositions yet known have but a slight degree of hardness, and are liable to crumble, I prefer a harder material, and have successfully used a varnish composed of fir balsam dissolved in chloroform. This varnish is most conveniently applied by means of the screw syringe mentioned above,

*So far as I know Dr. Dwinelle first suggested this plan.

having, however, a longer nozzle. In case the syringe is kept constantly charged, the nozzle should be stopped with a plug of wood to prevent the escape of the chloroform.

In the preparation of the cavity it probably is not necessary to say that the "cleavage," or "grain" of the enamel is an important point, which should not be lost sight of.



Section of a lower molar tooth with exposed pulp, showing the different steps of the process of capping and fiilling.

F, enamel; G, dentine; O, pulp; J, cementum.

The figure illustrates how the enamel rods on the margin (*a*) may be diagonally cut, as at *a'*, without weakening the enamel and rendering it liable to "chip out" around the margin of the filling (I). It also shows at the point (B) where the rods should not be diagonally cut, but left entire, in order to prevent chipping, which would occur if they were cut as in the line of X.

In preparing the dentinal portion of the cavity, it is well also to cut away the walls and floor, so that not only the filling, as a whole,

may be firmly anchored, but that the ends of all dentinal tubes, leading directly from the cavity to the pulp, may be covered with varnish, as shown between the points C C. But to accomplish this double object, all cavities in the grinding surfaces of teeth, where great pressure is to be made, should, if possible, be so shaped that when the oxychloride of zinc base (P) is inserted and has hardened, it may rest firmly, not upon the thin dentinal flooring (H) over the pulp, nor upon the capping varnish (K), but directly in contact with, and upon the centrifically inclined plane of the walls of the dentinal structure, as at D D. In approximal cavities, however, where there is not much pressure applied, this precaution is not necessary, and may be impracticable.

Though not absolutely essential to success in small exposures, it is sometimes well to carefully place over pulps extensively exposed a small concave platina cap (M), gently forcing it down into the varnish until it rests firmly upon the borders of the hole through the dentinal floor of the cavity where the pulp is exposed. Except in cases where there is large exposure of the pulp, I think that such caps are not only clumsy but superfluous. A small piece of something else, such as writing paper, or perhaps better, bibulous paper, will often answer the purpose better. All that is necessary is to prevent the first superincumbent material from displacing the varnish.

Having deposited the proper quantity of varnish (K)—which should be very limited—upon the exposed point (E) of the pulp (O), it should be carefully made to spread over the floor of the cavity with a delicate instrument until all the dentinal tubes leading from the cavity directly to the pulp are covered, in order, as before suggested, to cut off all communication that may cause pain. This may be easily understood by reference to the figure where the dark lines N N show the division between the dead and the living portions of the dentine (C) and enamel (F).

While this is important in order to prevent pain, and is the principal object of the varnish, it should not extend much beyond this "dead" line (N N), and smear any more of the walls than is necessary; for in that case it will not only injure the firmness of the main filling, but it is unnecessary and superfluous to varnish dead dentinal rods, which have already severed their connection with

the living pulp by decay, as illustrated by all that portion of the tooth above the "dead line" (N N).

Having deposited the varnish (K), as shown, it is not necessary to wait for the chloroform to evaporate, as is customary, but immediately apply a thin covering of cement plomb (L), of the consistency of cream, which is so plastic that it can, if applied delicately, be spread over the entire surface of the varnish without displacing it. The varnish insulates, as it were, the irritating properties of the cement plomb from the pulp, thus preventing pain, which almost invariably would follow were the cement plomb to be placed in contact with dentine over the pulp. Should, however, the varnish coating be injured, pain will generally follow in proportion to the extent of the injury of the "insulator."

Should the query arise, Why plomb cement, agate cement, or oxy-chloride of zinc is recommended for this purpose instead of the non irritant cement? I would say it is preferred because it is not only more cream-like in consistency, and more easily spread, but it makes a firmer flooring, less liable to crumble, and can be applied in less time, and is a better foundation to build upon; and, at the same time, causes no more pain if applied skilfully than the non-irritant material.

Having the pulp protected, and the varnish coat (K) hermetically sealed in by the cement; the chloroform is retained and made useful by acting upon the exposed portion of the pulp (E) beneath; and the morphine mixed with the wood creosote acting upon that portion of the crown of the pulp which is not exposed, the entire pulp is rendered insensible to any irritation that may take place—a condition tending to obviate any "shock," and which will continue until nature has time to act and becomes habituated to the presence of the capping material—a point of great value to both patient and operator.

Having accomplished the important point of painlessly protecting the pulp, a proper additional amount of cement (P) similar to that used for the flooring (L) should be introduced, after which, when it is sufficiently hardened, it may be dressed and shaped in readiness to serve as a basis for a metallic plug (I).

If amalgam be desired for the main filling, it may be introduced at the same sitting; but if gold is employed, it is better to defer it until a subsequent sitting, when the cement base (P) will be suffi-

ciently hardened to build upon. This method of capping exposed pulps is one of the simplest, speediest and most satisfactory operations in dental practice.

CAPPING EXPOSED PULPS.

BY A. C. ROBINSON, LOUISIANA, MO.

I have long held that healthy tooth pulps should not be destroyed, but should be capped and preserved alive. For the last five or six years I have practiced a mode of capping that has been reasonably successful in my hands. My method is as follows:

The cavity of decay should first be freely opened, so as to give easy access to all its parts, and at same time afford as good a view of the floor of the cavity as is practicable. After the excavation is completed apply a solution of soda-bicarbonate to the walls of the cavity; when the tooth is ready for the capping process.

A strip of stout tissue paper having been previously heavily varnished on both sides with an alcoholic solution of shellac furnishes the chief body of the cap. Cut from this strip a piece of proper size and form to fully cover the point of exposure. Smear both sides of the cap with Canada balsam, and carry the cap to its place. Adjust it carefully, avoiding all pressure, and cover it with Fletcher's Artificial Dentine. This latter should be mixed to the consistency of cream, and gently flowed over the cap. To do this I seize a small bit of spunk with the gold pliers and carefully push the soft material over the entire floor of the cavity, immediately removing the surplus, and leaving the covering in contact with the sides of the cavity to prevent subsequent movement of the cap.

If the main filling is to be of amalgam or other plastic material, it may be placed directly upon this covering; but if the filling is to be of gold, I cover the artificial dentine with os-artificial, and allow this substance to completely harden before attempting to fill with gold.

No discomfort should be felt by the patient when the operation of capping and covering has been completed.

If any pain is experienced the operation is probably faulty in some particular, and should be gone over again at once.

I give a preference to shellac for the principal substance of the cap, in consequence of its well-known non-conducting properties. This substance will also be found useful for coating the surfaces of sensitive cavities where the pulp has not become involved. No metallic filling should be placed in contact with sensitive dentine. If a thin layer of shellac is interposed between the metal and the dentine, sudden thermal or electric changes will be prevented.

I have kept accurate memoranda of most of the cases where capping has been done, beginning with November, 1872. My records include all my cases from the 1st of November, 1872, to the end of November, 1878, with the exception of those done in three several months, when the records were omitted. The period covered by this report is therefore nearly six years. During this time I have recorded 349 cases of capped pulps, with a loss of only ten—a little more than 3 per cent.

Most of the pulps of the lost teeth were considerably diseased, and many of them had been painful for several days before they came under my care.

The subjects included in the above statement range in age from as young as thirteen, up to those quite advanced in years. I at first encountered much prejudice against the operation of capping, but have steadily persevered, and now feel assured that my success has been sufficient to warrant its continuance.

STABILITY OF REPLANTED AND TRANSPLANTED TEETH.

BY DR. GEORGE F. WATERS, BOSTON.

This question is asked in the June number of the *Dental Cosmos*, Vol. xx, No. 6, p. 350, by E. Chenery, M. D., viz.: "Do teeth once extracted and then restored have a special tendency to subsequent inflammation?"

A little personal experience and the observations of the writer suggested the question. The observations referred to are in an article by W. H. Rollins, D. M. D., in the *Boston Medical and Surgical Journal* for March, 28, 1878. Dr. Rollins refers to a tooth which was "extracted, pulp-chamber filled; tooth replaced, and remained useful five years and eleven days, when, without direct cause, it suddenly took on inflammation and had to be removed." "This suddenly-appearing pain and lameness," says Dr. Rollins, "occurs in a great majority of those teeth which, after being replaced, become firmly united with the body."

"This statement," says Dr. Chenery, "the author attempts to corroborate by stating that Dr. Waters has had quite a number of such cases, and every one of them behaved in a similar way." Taking it for granted, in the absence of other indices, that I am the Waters referred to in both cases, as I have corresponded with Dr. Rollins on the subject, I turn to his article, and find the passage where my name occurs to read thus: "This suddenly-appearing pain and lameness occurs in a great majority of those teeth which, after being replaced, become firmly united with the body; in fact, Dr. Waters, who has had quite a number of these cases, has found this symptom in every one."

It may be a late date to correct the above, but, as it may be "better late than never," I wish to say that Dr. Rollins, probably, made his statement under a misapprehension of what I wrote to him. What I meant to say, in writing to him, is this: That of the teeth replanted or transplanted by me, which became firmly united with the body, *and subsequently became sore and loose*, all gave to their possessors a sudden sharp intimation of something wrong in or about them as though something had broken, and then became sore and loose. Take, as an illustration, the teeth which I have transplanted or replanted in my own head. The first, a replanted tooth, was broken off diagonally in the jaw, half way up the root, after five years of uninterrupted service, it was loosened by coming in contact with a small boulder of silex, granite or porphyry, which was supported by the antagonizing tooth. The latter tooth also was lamed, for a time, by the shock. The loosened crown remained in the head, giving some service for six months and then dropped out The fractured end was quite smoothly

polished where it had slid upon the fixed portion. This portion did not leave the socket for two years.

If there had been no lateral strain in this case the whole root would probably have loosened from so great a shock instead of fracturing, and after treatment by sulphuric acid, would have re-united with the jaw, as I have had cases do. There is at times, in masticating food, great strain upon the teeth, both in a lateral and vertical direction. Nature gives, in the lining membrane of the root and socket, ordinarily, an elastic cushion to receive the impact or shock which an unexpected resistance gives, such as we feel on meeting a stone or nail in our food; but in the case of re-planted or transplanted teeth one of the linings has disappeared, and the other furnishes ossific attachments in those cases where immobility obtains.

Now, if such a tooth be subjected to a regular and moderate service, without accident, no pain or untoward event happens, unless its antagonist master it, so as to give a strain in an oblique direction, and then it becomes firmer set in the jaw and the antagonist goes to the wall, or becomes loose, but not suddenly. It seems as though nature in this case sought to make a double cushion for the tooth, which, antagonizing the anchylosed one, has to receive double the amount of shock, but the socket walls under this great fluctuating pressure give way on the inside; and we have yet to learn how to cause a compensating external development for this internal absorption. Until we gain such knowledge it would seem desirable to use the "ounce of prevention," by so shaping the ends of these teeth as to avoid a lateral strain.

There are other causes for teeth giving way that have been transplanted or replanted and become firmly united with the body, and one of the most prolific is uncleanliness. I have never been able to obtain firm attachments where people were in the habit of smoking, and therefore I always require patients to give up the use of tobacco in any form before I operate, as otherwise time and effort are spent in vain. After the tooth has become firm, they risk the loss of it if they begin again. I have a number of cases which go to show this result. Personal habits have much to do with the durability of any teeth, and most of all with those that have been either replanted or transplanted.

MOLECULAR DYNAMICS.

BY L. R. CURTISS.

Dynamics refer to force or power. It deals with the primary conceptions of energy in its relations to subjects that are susceptible of numerical estimation, such as time, space and velocity; or, again, dynamics is that branch of science which measures the energies producing motion as well as those produced by motion, and is divided into two parts: kinematics, which pertains to motion without regard to the bodies acted upon; and kinetics, which refers to the cause of energies whereby motion is given to bodies, each of which is the antithesis of static energy, or energy at rest. Molecular dynamics has for its domain the actual working forces inherent in the atoms and molecules of matter. This branch of the subject bears the same relation to physics as the differential calculus does to mathematics; and by thus dealing with the physical molecules and atoms we are enabled to extend the kinetic chain of causation down toward the infinitely small, with a certainty almost parallel to the accuracy with which the integral calculus defines the motion of the planets.

The text-books teach us that one of the properties of matter is inertia, including both that of rest and that of motion, the former being defined as the passive condition of bodies when at rest. This definition refers to matter as a mass. The new philosophy, however, teaches that, since molecular motion refers to the invisible movements of the particles of the mass, there is no such thing as complete rest of the ultimate particles of matter short of absolute zero of temperature, which, if universal, means total frigidity of every sun and orb in the universe.

The current of scientific thought tends to demonstrate that all the phenomena of Nature are to be regarded merely as varieties of motion, one guiding principle of which is conservation of energy. This being an established fact in science, it fortifies us in our position of reasoning downward in the direction of primary causes. By conservation of energy, we are to understand that, while matter exists throughout the universe in definite quantity, there is also existing, as an attribute of matter, a definite amount of energy or

force; and just so sure as matter is indestructible and unchangeable, just so sure is force or energy indestructible or interchangeable—that is, matter and force are both indestructible, but force or energy (synonymous terms) is convertible into the several modes of force. The attributes of matter are attraction of gravitation, attraction of cohesion and chemical affinity Attraction of gravitation is a force exerted upon each and every atom of matter throughout the universe, with a never-ending geometric ratio, varying directly as the mass and inversely as the square of the distance. The force known as chemical affinity binds the integral particles of compounds in an embrace many millions of times stronger than that of gravitation, but, like cohesive attraction, is incompetent to exert its power beyond very short distances, such as those measured by the limits of the molecule.

The correlation of physical forees has for its domain the interchangeableness and universality of the forces of Nature. It is competent to solve the dynamical problems of vital and physical phenomena, demanding from every antecedent its consequent, and exacting from every consequent an equivalency of antecedent. All sound experience of whatever kind justifies this affirmation These views compel the idea of the universality of motion, and that force is the eternal causation of each and every phenomenon, and that the existing relations between matter and force remain constant throughout the universe. The same forces that whirl suns and planets in a restless march through shoreless space, measure the phenomena of the moments of life.

The different consequents of molecular motion are sound, light, heat, etc., the antecedents of them all being some mode of motion. By the term "mode of motion" is meant the manner in which energies are made sensible to our understanding. Thus, the terms heat, light, etc., are but familiar ones by which we express the various modes in which force is exhibited to our senses in its action upon matter. Conservation of energy was denominated by Faraday as "the highest law in physical science which our faculties permit us to perceive." Its unfoldings mark an intellectual epoch, which divides the old from the new. It teaches of the unity of the universe; it tells us how the sun's rays constitute the mighty energies of daily life and action upon every hand, warming, illuminating and vivifying the surface of the globe.

As an illustration of this interchangeableness of force: suppose two files of men to be arranged in proper order, between which we roll a cannon-ball with a certain initial velocity. This ball runs the gauntlet of those files of men, it being the individual duty of each man to retard the momentum of the ball by interposing his hand in its path. It is evident that each hand so interposed will receive a shock, the force of which is just equivalent to the amount parted with by the ball itself. Finally, the ball comes to rest. The original momentum of the ball has for its equivalency the sum total of the lesser energies imparted to the several hands interposed. Or, again, if, instead of hands interposed, we substitute a row of smaller balls, and let them receive the impact of the moving one, the result will be just the same. Each and every ball interposed will have the motion of its constituent particles augmented by an amount of energy of motion exactly equivalent to that parted with by the larger ball; and, when the moving ball finally comes to rest, the sum total of molecular energies in the interior of each ball is exactly equal to the original momentum of the larger ball. Thus we have an illustration of the transference of molar into molecular motion, the molecular motion making its appearance as heat, one of the modes of force. If you push endwise against a stick of wood, the force applied will immediately appear at the other end. This is transmission of force by means of molecular action. The force being applied to one end of the bar is transmitted from particle to particle with great velocity its entire length. If a row of bricks be properly placed, any force applied to the first of the row, sufficient to topple it against the next, will be transmitted throughout from the first to the last of the series. Or, again, if the bar of wood be pushed against one end of our imaginary row of bricks, we shall have in the rod and in the falling bricks a continuous chain of similar phenomena, the action of the bricks being a *visible* illustration of the transmission of force, and highly analogous to that *invisible* transmission along the molecules of the bar.

Apart from the different modes of force, we have energy in two forms—static or potential, and actual or dynamic. The potential has been likened to a weight wound up, and the actual to a weight in the act of falling. The amount of energy expended in winding up the weight, less the friction, is exactly equivalent to the potential energy of the weight so raised, also to the dynamic energy

given out by its falling or running down. The inherent measure of force possessed by each and every atom is its kinetic energy, and this energy is the correlative and antecedent of all the modes of force which characterize the various phenomena of the visible universe. The condition in which matter presents itself to our senses depends upon the degree in which these several forces are made manifest. All the phenomena of Nature consist in transformations of energy only, the working force of the universe being previously invested in the kinetic energy of its atoms.

The potential energies of the atoms of matter, in their free condition, are almost beyond human comprehension. Thus, heat a pound of charcoal to the point of incandescence. The vibratory motion of the atoms of carbon will then have reached an amazing velocity; oxygen rushes in to form new compounds; the oxygen-atom, by its impact upon the coal, has its motion of translation converted into vibratory motion, which immediately appears as heat. The clash of these atoms makes up the sum total of the energies of the combustion. The actual amount of dynamical energy set free by the union of this pound of charcoal with atmospheric oxygen is equivalent to the mechanical raising of eleven and a quarter million pounds one foot high.

Let us further consider the dynamical forces inherent in the molecules of free gases, and look to a molecular explanation of the three states of matter, the solid, fluid and gaseous. In solids, the atoms are held together with a rigidity that develops the full strength of cohesive force. In liquids, the same attraction is so far lessened that a definite form can only be preserved in a limited degree, as in drops of water maintaining a spheroidal shape against the force of gravity. In the gaseous form, atoms do not cohere, the cohesive force having been translated into the energy of motion; and it is this energy of motion which constitutes the expansive force of confined gases.

Suppose we have a vessel containing eight pounds of oxygen and one pound of hydrogen. This mechanical mixture of gases, invisible though it be, and harmless as it appears, is the theatre of energies wholly beyond our conceptions. Figure to your imagination these gases made up of atoms so small that a billion times a billion would scarcely fill a cubic inch; and all these atoms vibrating among themselves without actual contact. Although the

minute distances over which these atoms travel are utterly immeasurable by direct appliances, we shall presently see that the energies evolved by the clash of their chemical union is something prodigious. The concussion of atoms at the union of eight pounds of oxygen with one pound of hydrogen sets free an amount of energy, in the form of heat, equivalent in mechanical value to 47,246,400 pounds let fall one foot, or the crash of a ton's weight, as an avalanche, down a precipice of 23,623 feet.

The three states of matter have been likened to three planes, of which the gaseous is the uppermost, the fluid occupying the intermediate plane, and the solid state for the lower one. The clash of atoms at the union of the two gases has resulted in the liberation of the energy above mentioned; but a change of state has taken place, and we now have water in the vaporous condition occupying the intermediate plane. This nine pounds of steam in condensing to water sets free an energy, the mechanical equivalent of 6,722,000 pounds let fall through the space of one foot. The next change takes us past the reduction of the temperature of the water from the boiling to the freezing point, setting free both the specific and latent heat of the water. This final fall to the plane of congelation occasions a further dissipation of energy equivalent to 2,237,256 foot-pounds, making a grand total of 56,000,000 foot-pounds as the measure of energy in our nine pounds of invisible gas.

The verity of these statements might be questioned were it not that the most refined researches give unvarying results. Suppose we reverse this experiment, and, commencing with nine pounds of ice, we will, by a process of mental abstraction, again bring our conceptions down to the immeasurably small, and fix our attention upon the molecules of the ice. Figure to yourself the atoms of each molecule as being in oscillation through points of equilibrium. And, while your attention is centered upon the motions taking place in the interior of the mass, we will let fall upon the block of ice a concentrated beam of sunlight, and see how it deals with the inherent forces of cohesion and chemical affinity. The solar undulations impinge upon the molecules of the ice, and, under this bombardment of heat waves, see how rapidly the atoms accelerate their motions! All this while the contest is going on between the dynamic energy of the sun's waves of heat and the cohesive force of the molecules. Beautifully and symmetrically the forces of

nature built up the crystalline mass; and as surely and silently the sun's competency of heat will effect its liquefaction.

Thus far we have seen the atoms accelerating in velocity by virtue of the energy imparted by the solar-heat waves, and all this time they are vibrating within the definite limits of the molecule. A further increase of heat will increase the motion of the atoms, thus tending to a rupture of the bonds of cohesive attraction. The struggle goes on until the ice melts, by which process we have solar energy conserved in the latent heat of water. The molecules being thrown almost beyond the range of cohesive force, their movements are no longer confined to their former limits, but may extend throughout the length and breadth of the mass. This is the fluid state. The amount of energy required to swing the atoms so nearly beyond the range of cohesive attraction, or simply to melt the ice, is equal to 500 tons raised one foot high. This force still exists as transmuted energy, and is the latent heat of water. A further addition of heat takes the form of increased vibratory action up to the boiling-point. Then comes another struggle seven times greater than the first. This last remnant of cohesive force of water must be surrendered, and the heat-energy necessary to perform the act is conserved or transmuted into the latent heat of steam. The last vestige of cohesive force now being gone, the molecules of steam are free to oscillate in all directions, and impinge against the walls of the containing vessel. If we continue the application of heat to the point of dissociation, the molecules of vapor will have acquired a momentum sufficient to rupture the bonds of chemical affinity. And here the energy required to separate the molecules of steam into its constituent atoms of oxygen and hydrogen is simply prodigious, being about forty-eight times as much as was necessary for the process of liquefaction. Thus the aggregated energies required to set free the oxygen and hydrogen in our nine pounds of ice are equivalent to the raising of a ton's weight, 28,000 feet; and we now have the original nine pounds of gas, laden with the potential energies of 56,000,000 foot-pounds, which is just equivalent to the requisite liberation of force necessary to reduce the gases back again to the solid form of ice. A cubic foot of water yields 1,862 cubic feet of the separate gases when at normal condition; and no human device is competent to overcome this expansion by pressure sufficient to reduce them back again to

the liquid condition. Upon the evidence of Faraday, we have it, that "the decomposition of a single drop of water by electricity, calls for an expenditure of more electromotive force than would suffice to charge a thunder-cloud."

Our main source of dynamic energy is the sun. His energy is exhibited in every wind that blows, in every shower that falls, and in the history of every snow-flake; in the glare of gas-lights, in the heat of the furnace, in the colors of the rainbow, and in the gorgeous sunset; in the beauty of vegetation and its silent growth. Thus, in an almost infinite variety of physical phenomena, we see this transmutation of solar energy. This energy, after doing its allotted work, is in time dissipated into space by radiation; and, were it not for the intermediate position of the vegetable kingdom to check this degradation of energy and raise the elementary constituents from the chemical to the organic plane, man's duration here would be short indeed. The locking up of potential energy in the protoplasmic cell of the plant requires the expenditure of a vast amount of energy, but the solar ray, aided by the subtle alchemy of the leaf, is competent for the task; and, while the chlorophyl of the leaf assists in weaving organic tissues from the air, this outward dissipation of energy is delayed for a while, giving us food for our bodies and fuel for our fires. This final process of combustion once more converts these potential energies into the dynamic form and sets them free to dissipate into space. All the mechanical power which comes from the combustion of fuel, and all the muscular force of the animal kingdom, is but the transmutation of solar energy through the mediumship of plant-life. Well might we say, as did the pagans of old, "We are children of the sun." This flood of solar force is unceasing. Waves of ether may conduct a store of energies across the universe and invest them in a wealth of carbonaceous flora; these energies may lie dormant in vegetable fossils for untold eras; man may delve in mines and exhume the coal, and enlist the aid of oxygen to break the bonds of chemical affinity, setting free those energies stored away in the countless ages of the past; he may unfold link after link of the great dynamic chain of causation, and subject them to the scrutinizing analysis of the physicist; he may survey the rocks and tell us of their radiations of internal heat, or by his calculus tell us for how long in the past this planet may have been the theatre of life

and death; he may tell us, not only of the energies in the atoms of a drop of water, but of a world of atoms; nay, more, of a universe made up of atoms with their energies drifting out into measureless space: but he can tell us naught of that unseen universe into which the energies of the visible creation are ever tending.

While dealing with the forces of nature from an atomic standpoint, we are treading upon the border-land of science, beyond which all sensible phenomena have their origin.

Science may, by spectrum analysis, determine the constitution of the irresolvable nebulæ; it may tell us of the millions upon millions of ethereal waves necessary to impinge upon the retina to produce a given chromatic effect; it may measure the waves of air that roll as music down upon the tympanum of the ear: but how undulations upon the retina or vibrations of the auditory nerve are converted into consciousness of sight or sound, is a question which, like the causation and mystery of life, belongs to that realm outside of the domain of science—a realm the infinite mystery of which transcends all analysis!

In conclusion, let us not be led into a rigid belief that the present views of molecular physics are competent to explain all the phenomena that may be presented for solution for all time to come. It is enough to say that it answers our purpose in giving a satisfactory explanation of a large class of natural phenomena, as they are exhibited to us in daily life. But, as we know the favored ideas of scientists and scholars in generations preceding ours have given way to newer and better ones; so, in turn, the popular conceptions of to-day may serve as stepping-stones to coming ideas, each destined to take its place as the predecessor of a higher and better intelligence.—*Popular Science Monthly.*

EXTRACT FROM A PAPER READ BEFORE THE N. Y. NEUROLOGICAL SOCIETY—NEURALGIA FROM DEPOSITS IN THE PULP CHAMBER.

BY D. H. GOODWILLIE, M. D., D. D. S.

F. G., aged 41 years, sent to me by Prof. F. H. Hamilton, in June, 1870, has had neuralgia of the right side of the face for the past twenty years. It was contracted by exposure to wet and cold in the gold mines of California. It has gradually increased until now the paroxysms appear about every five minutes. He is well developed physically; and has always been healthy until the present trouble supervened. But he now presents a most woeful appearance from his long and constant suffering.

The pain has been somewhat changeable. At first, it appeared in the inferior dental nerve at its exit upon the face, at the mental foramen. Sections of this nerve were made twelve and seven years ago, with only temporary relief.

He now suffers very much from the infra and supra-orbital nerves —the former, particularly. During his paroxysms of pain he has lachrymation and salivation; and, in the middle of a sentence, while speaking, he is obliged to stop short until the paroxysm has passed away. He has taken all the known remedies for neuralgia; yet it has steadily increased. He is willing to submit to any treatment to obtain relief from his great trouble. No history was given of either hereditary neuralgia, rheumatism or gout.

The mouth was examined; all the teeth were present except a few of the back molars: the remaining teeth were all sound except two very small cavities in the superior molars which were filled and could cause no trouble. From my past experience in these cases, I was led to suspect that there were calific deposits in the dental pulps. A few teeth were extracted; and when the teeth were split open, deposits were found inclosed by the vessels of the pulp. All the remaining teeth were extracted; and sections being made, deposits were found either in the pulp chamber or in the nerve canals. In some of the teeth presented here, will be seen large and small granules in the substance of the pulp. In the canal

of the roots will be seen also a narrowing of the canal by deposits on the walls.

As these calcified masses formed, the vessels of the pulp were encroached upon, and strangulated; and the pressure on the nerves caused severe pain.

In some of the teeth, it will be seen that the dental pulp was entirely cut off in the roots by deposit in the canals.

This patient remained under observation for some time before he returned to his home; and up to that time appeared entirely relieved from his suffering: since which time I have not heard from him. I cannot say that the prognosis will be entirely favorable in this case.

It being of long standing—the patient apparently in the decline of life—pathological changes in the structure of the nerve tissue may have taken place. The lachrymation and salivation are unfavorable features in the case, as they show that he is suffering from secondary affection of the glands.

Whether the deposits in the tissue of the pulp are the cause of his neuralgia, or a consequence thereof, is difficult to decide. Certain it is, that they have been a source of intense suffering.—*American Journal of Dental Science.*

REMARKS.—It seems to us that the extraction of the teeth in the above case was of very doubtful necessity. We should certainly have first exposed and destroyed the pulps, emptied the pulp chambers and the root canals of their contents, and then filled. Extraction should have been reserved as a last resort, unless there were conditions present that are not described in the foregoing extract.

HISTOLOGY.

ON THE STRUCTURE OF THE BLOOD-CORPUSCLES OF THE OYSTER.

BY A. H. HURLBUTT.

If we break the shell of an entirely fresh oyster on its thinnest edge, a small quantity of sea-water will ooze out. If we open the oyster by pulling apart the two valves, around the injured oyster a

large quantity of fluid accumulates. This fluid contains the blood-corpuscles. First we oil the edges of an extremely thin cover on one side, place a small drop of the juice of the oyster upon a slide and cover it with the covering glass, the greased edges looking toward the slide. We then have a specimen ready for examination with the highest powers of the microscope.

A power of about five hundred diameters will reveal numerous granules floating in the fluid, in what has been termed molecular motion. These are granules of fat, of pigment and of broken protoplasm. In the fluid there are swimming very often parasites, which I do not wish to consider at this time. Furthermore, *debris* of the tissues of the oyster and epithelia are to be seen; and lastly, numerous granular bodies, varying considerably in size and form, and continually changing their shape and locality for at least two hours. These are the blood-corpuscles of the oyster. Let us now put on a lens with a magnifying power of twelve hundred. I used an immersion lens of Tolles, of Boston, and one of C. Verick, of Paris, both magnifying about twelve hundred diameters, with a short eye-piece, and both giving the same results as to the structure of the protoplasmic bodies.

We find globular bodies of the size of human red-blood corpuscles, to be considered as free nuclei, suspended in the fluid; and of which nuclei it is impossible to say whether they exist, as such, in the live oyster, or are freed by the injuring manipulation. Besides, spindle-shaped bodies are present, not surpassing the nuclei in size. Lastly, protoplasmic bodies are visible, varying in size from one-and-a-half to seven or eight diameters of a human red-corpuscle, partly roundish, partly elongated in one or several directions, or stellate—that is, provided with a number of delicate, radiating offshoots. These protoplasmic bodies are in amœboid motion, changing their shape continuously by projecting flaps or elongated offshoots (the so-called pseudopodia) on different parts of their peripheries, and withdrawing them again. The changes of shape are not very lively, about as slow in character as we observe them on the amœba diffluens, or in colorless blood-corpuscles of the newt. At the same time locomotion of the protoplasmic bodies takes place, so that a corpuscle might migrate through the field of vision of the microscope within one hour. On the free nuclei I did not observe changes of shape or locomotion.

The blood-corpuscles are either devoid of a nucleus, or during the observation there may appear roundish bodies within the protoplasm, looking like nuclei, and disappear from our view. Other corpuscles from the very beginning show from one to five or six nuclei. When nuclei are thus visible at the beginning of the observation, they remain unchanged until the corpuscle, in which they exist, becomes motionless. In corpuscles in which no constant nucleus can be made out, sometimes a nucleus becomes visible when the corpuscle approaches the time of its death—that is, when it becomes motionless.

Let us now watch a corpuscle in which a nucleus is plainly marked, and we shall see, as follows: The nucleus is surrounded by a yellowish, shining shell, which either is uniform in its width or looks beaded, as if built up by a number of granules, which are connected with each other by a thinner layer of the same substance of which they themselves are composed. Within the nucleus we again find granules, either uniform in size, or some appearing to be considerably larger than others; these latter bear the name of nucleoli. The granules vary greatly in number, and are either scattered irregularly throughout the nucleus, or are arranged in the shape of wreaths, concentrical with the outer shell of the nucleus. Sometimes two, or even three, such wreaths are to be observed within the nucleus, a fact to which Eimer (*l. c.*) first drew attention. In small nuclei we observe sometimes one central granule (nucleolus), and from this granule there project fine threads, from three to six in number, conical in shape, the bases of the cones arising from the granules, their ends tending toward the wall of the nucleus, with which all the cone-like threads are invariably in direct union. Thus, a wheel-like figure is constructed; the hub of which is represented by the central granule (nucleolus), the spokes by the conical threads, and the felloe by the shell or outer layer of the nucleus, the latter representing only the optical section of the surrounding layer of the spheroidal body. All the described formations are suspended in a pale, colorless and structureless substance, between which and the fluid part of the blood outside the corpuscle no distinction can be drawn. When there are several granules present within a nucleus, all are joined together by means of fine, grayish threads, the granules thus representing the intersection of a net-work which traverses the whole interior of the nucleus. The granules next to the wall

of the nucleus—it is immaterial whether regularly or irregularly placed—send delicate, grayish threads toward the wall of the nucleus, with which they inosculate. The meshes of the network within the nucleus, filled with the homogeneous, colorless substance, vary in size. I, however, was not able to decide whether, during the motions of the whole corpuscle, there were also changes in the shape of the network within the nucleus, which S. Stricker asserts he has noticed in the network of the nuclei of the colorless blood-corpuscles of the frog and newt.

The structure of the nuclei, as just described, is visible on almost all nuclei, no matter how many may be seen within a protoplasmic body, and also on bodies floating in the fluid specimen which were described before as free nuclei. In none of the latter could I ever discover changes of shape or active locomotion. Not very rarely, however, we meet with small nuclei within the blood-corpuscles which look almost homogeneous, and of a pale, grayish-yellow color, apparently devoid of structure. Such nuclei, which we might consider as somewhat larger granules, are also suspended in the outside fluid part of the blood, as well as within the protoplasmic bodies.

Whenever a nucleus is to be seen within a protoplasmic body, outside its shell a light seam can be observed always traversed by conical, radiating threads which spring by their broad bases from the shell of the nucleus, and unite by their thin ends with the granules next to the light seam. Such conical offshoots arise from compact nuclei, thus giving them the appearance of angular bodies. Throughout the whole protoplasm granules of different sizes are scattered, all of which show the same color and the same power of refracting the light the same as those within the nuclei. These granules are united with each other by slender threads in the same manner as those within the nuclei. Very often the appearance is presented of a single granule surrounded by wreaths of other granules, all the latter being united by means of radiating, conical threads, both to the central granule and to each other. Such small, wheel-like bodies may arise in different places in the protoplasmic body in the changes of shape. Besides the grayish-yellow granules, there are numerous others of a more yellow color, and of a greater refracting power, identical with that of fat-granules. Experience shows that such fat-granules are more numerous in the latter part of the breeding

season of the oyster—viz., in July and August. Many of these fat-granules are connected by means of delicate threads with the neighboring protoplasmic granules.

During the changes of shape of the blood-corpuscles often round spaces appear within the protoplasmic bodies, the so-called vacuoles. These vacuoles vary greatly in size; they are filled with the light, structureless fluid substance which we see within and without the meshes of the network. In this fluid within the vacuoles sometimes there are granules floating about. Each vacuole is surrounded by an extremely thin, grayish-yellow layer, which is always in union by means of delicate threads with the neighboring granules of the protoplasm. Sometimes several vacuoles arise within the corpuscle, and are separated by a continuous layer, like the shells of the nucleus, and these shells give the appearance of a framework. The same appearance of vacuoles, though on a considerably smaller scale, I have repeatedly observed also on nuclei originally homogeneous and structureless-looking.

A continuous, though extremely thin, layer can be seen on the periphery of and closing in the protoplasmic body. The outer surface of this layer looks smooth, while its inner surface is in connection with the neighboring granules by means of delicate threads.

While we watch a blood-corpuscle of the oyster at the common temperature of the room, continuous changes of the shape are visible, as mentioned above. At the same time change of the network within takes place. Temporarily, the granules seem grouped together, and the meshes considerably narrowed; opposite to such a group of closely-packed granules flaps bulge out from the periphery of the protoplasmic body. Within a flap there is faintly visible a network only at the beginning of its protrusion; very soon this network is completely lost to sight, and the flap looks homogeneous and comparatively structureless. At other times delicate, narrow hyaline offshoots are projected from the periphery of the blood-corpuscle, varying in number, and sometimes considerably surpassing in length the diameter of the protoplasmic body. These so-called false legs (pseudopodia), as a rule, look homogeneous, and run either in a straight direction or are curved and repeatedly bent. They are being projected and withdrawn frequently during the changes of shape of the corpuscle; sometimes they are thrown out so regularly, and in so great a number, that the corpuscle

assumes a beautiful star shape, the central body at this time being considerably decreased in size, and its granules closely packed together. The offshoots may also be irregular, and the blood-corpuscle may take on a considerably elongated, irregularly angular and branching shape. On thicker parts of the offshoots the net-like structure of the protoplasm is to be seen, while their ends always look hyaline and structureless.

During the changes of shape sometimes a number of granules melt together, thus producing the appearance of a temporary nucleus; such a nucleus after a few minutes may disappear again and a network be re-established, where shortly before there was a compact lump. Sometimes round bodies looking like nuclei jump forth from the interior of the blood-corpuscle, and float freely in the surrounding fluid. Sometimes protruded flaps become pediculated, and shortly afterward, through breakage of the pedicle, an isolated, pale body is separated from the original blood-corpuscle. Sometimes the protoplasmic body is becoming constricted on different parts of its bulk, and such constriction may terminate in a separation of smaller lumps from the original body; on some of these lumps even the net-like structure of the protoplasm is still visible. Thus a larger blood-corpuscle may be divided into smaller lumps of a different shape.

After from one to two hours' observation the majority of the corpuscles, partly already considerably decreased in size through repeated divisions, swell up and are provided with vacuoles and large, structureless flaps. In this condition the network within the protoplasm is evidently broken apart, inasmuch as the granules are no longer connected with each other, but float in the interior of the protoplasm in a sort of motion for which term "molecular motion" has been adopted. Lastly, a swelled protoplasmic body bursts, and the granules are spread on the surrounding fluid, and with this complete death of the blood corpuscle has ensued. Blood-corpuscles of perfectly fresh oysters die after having been kept for about two hours under the microscope, while those from oysters which have been kept out of the sea for a couple of days die much sooner and more rapidly.

From the facts just described it would appear that the assertion of C. Heitzmann with regard to the structure of the protoplasm as

general throughout the animal kingdom, is corroborated, also, by the blood-corpuscles of the oyster.

Those observers who confine themselves to the study of the net-like structure of the nucleus only (including even S. Stricker, of Vienna), seem to have narrowed without any stringent necessity, inasmuch as the structure of the protoplasm is by no means different from that of the nucleus. There are only three authors (Van Beneden, of Brussels, Theodore Eimer, of Tubingen, and E. Klein, of London), who have seen the network in different protoplasmic bodies. That such a structure does exist no one can doubt who is painstaking enough to observe the protoplasm with reliable and sharply-defining immersion lenses.

Now, the question arises, What does this network signify? Those who study the protoplasm in dead specimens, preserved in different reagents, may obtain a clear view of the network. J. J. Woodward, of Washington, in his famous microphotographic plates of cancer specimens, published two years ago, succeeded in representing the network on all protoplasmic bodies, being in the right focus, by means of moderate magnifying powers of the microscope, but with strong oxy-calcium light.

Indeed, the significance of the network can be cleared up only by the study of fresh, living and creeping protoplasmic bodies, and among these the blood-corpuscles of the oyster are highly recommendable, as the material is easily obtained and easily manageable.

From the circumstance that the network within the protoplasm keeps changing for from one to two hours, or as long as the corpuscle is living and changing its form and locality, we must conclude that the network is the contractile or living part of the protoplasm. Therefore, the nucleoli, the granules of the nucleus, the shells of the nucleus, the granules of the protoplasm, the shells of the vacuoles, the boundary layer of the corpuscle itself, and lastly, all the threads uniting the above-named formations to each other, are formations of living matter. The substance, on the contrary, contained in the meshes of the network of the living matter and filling the vacuoles, must be considered as a fluid not differing essentially from the plasma of the blood in which the corpuscles float about. That it is a fluid, we must conclude from the lively changes of the network itself, which would be impossible if the network were

imbedded in a solid substance; from the easy formation of vacuoles during the life of the corpuscle; and lastly, from the swelling of the whole corpuscle when approaching death, which phenomenon can be due to diffusion only. As no fluid is ever endowed with the properties of life, the fluid contained in the meshes of the protoplasm can not be living.

Doubtless, the different conditions of the living matter cause the changes of shape and also the changes of place—namely, locomotion. It is easily to be seen that with a grouping together of the granules (the point of intersection of the network) and the narrowing of the meshes, on a point opposite the place of active contraction of the living matter, a bulging out of a flap takes place. This bulging is apparently due to a passive extension of the living matter, as at the beginning of the protrusion an enlarged network is faintly visible, which, however, is soon afterward lost to sight, owing evidently to an extreme stretching of the network. Both contraction and expansion of the network may subside into the condition of rest for a period of time as long as the protoplasm is alive. Segmentary contraction may lead to the projection of starlike elongations (pseudopodia). Irregular contraction may result on irregularly-elongated shapes of the corpuscle, and the highest degrees of local contraction will result in constrictions, which again may terminate in the separation of single lumps from the mother body. Finally, owing to an accumulation of the fluid within the protoplasm, the latter becomes provided with vacuoles or swells *in toto*. The latter condition leads to a rupture of the network inside, the *debris* of which float about in the protoplasmic fluid in the shape of isolated granules. With the bursting of the whole body the death of the blood-corpuscle is accomplished.—*N. Y. Med. Journal.*

THE MAGNITUDE OF THE NERVE CELLS.

Upon what depend the variations in size of the cells of the central nervous system? An attempt at an answer to this question has been lately given to the Academie des Sciences by M. Pierret, Professor at Lyons, who suggests that the size of the cell is in

simple relation to the length of the fibre connected with it. Of the motor nervous system the largest nerve-cells are situated in the lumbar region of the spinal cord, and in the fronto-parietal convolutions. These two points are related one to the other, and the distance which separates them is very considerable. Moreover, the longest nerves of the body—the sciatic—arise from that point in the lumbar region in which are the largest motor cells. In the dorsal region the motor cells are far smaller. The distance from the brain is less, and the course of the nerves which spring from them is relatively short. In the cervical region the cells are larger than in the dorsal region, but smaller than those of the lumbar, which may be explained by the fact that they are not far from the brain; but the course of the nerves arising from them is of considerable length. So also with the hypoo-glossal nerve, the cells of which are only a little smaller than those of the cervical enlargement. For a similar reason the cells of the higher motor centers lessen in size in proportion as their distance from the cerebral hemispheres become less. Hence the sixth nerve is connected with larger cells than the third and fourth. Lastly, in the corpora striata, the cells are still smaller, and may be distinguished in form from those of the optic thalami or corpora geniculata or corpora quadrigemina.

In the sensory system, the largest cells are found in the posterior vesicular column, in the neighborhood of the lumbar enlargement. These cells probably receive the centripetal fibres from the lower limb, and they are removed for a considerable distance from the occipital lobes. The cells of the ganglia of the restiform body which receive the sensory fibres of the brachial nerves, and the nucleus of the sensory part of the fifth nerve, both have much smaller cells than those of the lumbar posterior vesicular columns, and they are much nearer the cerebral cortex. The cells of origin of the optic nerve are smaller than those of the fifth, and larger than those of the olfactory. The shortest nerve is that which is connected with the smallest cells—the auditory. Hence M. Pierret infers that the law which governs the increase or decrease in size of the cells is the same for both the sensory and motor cells, and may be formulated thus—that the size of the motor and sensory cells of the nerve-centers of man is directly proportioned to the distance which separates them from the peripheral organ which they innervate, and from the

cerebral center. This law is true for the cells of the cerebral cortex, for the largest cells are met with in the fronto-parietal regions related to the lower limbs, and in certain of the occipital convolutions cells are met with almost as large.

The theory is one of considerable interest, and there may be "something in it," but we doubt whether the accordance between the two elements, length of fibre and size of cell, is so close as to justify the formulation of so precise a law upon the subject. Moreover, we know too little of the precise anatomical relations of the parts of the nervous system to permit us to generalize from the length of the fibres which probably commence and end within it. For instance, it is not at all proved that the fibres of the posterior nerve roots are connected with the cells of the posterior vesicular columns. The variety in size of the cells in the same group is also difficult to explain upon the theory of M. Pierret. The theory probably approaches as near an explanation as is possible in the present state of our knowledge, but it is doubtful whether that knowledge is yet sufficiently accurate to permit useful generalization.—*London Lancet.*

BIOPLASM.

Among the recent discoveries in science, none perhaps will prove of more utility to man than those relating to bioplasm, because they throw light on physiological questions, particularly those concerning the construction and nutrition of the body and the causes of disease. It was formerly supposed that our bodies were alive from top to toe, inside and out; but this is found to be a mistake. Only about one-fifth part is alive; the rest is formed material. Everybody knows that a tree may become so hollow that only a shell is left; yet the tree may grow and mature buds, and leaves, and fruit. It is because the outside of the tree—the bark—is alive: the wood is non-living; it is simply formed material. Now the body is not like the tree—alive only on the outside; but the living portion and the formed material exist together in every part—in every tissue, organ and vessel.

A slight abrasion of the cuticle, or the rupture of a cell, is followed by particles of fluid which were formerly overlooked as of no

account. But the microscope has revealed to us that this apparently useless, insignificant ooze is the vital, living part of the body—it is *bioplasm.*

This is the mechanic—the skilled artist—that constructs the cells, builds the organs, and perhaps, under the direction of a higher power, adapts each part to one harmonious whole.

For the last fifteen years, certain English and German physiologists have spent much time with the microscope, watching this little workman. They have seen it forming tissue, muscle and nerve, changing food into blood, making the secretions, and, as parts of the body became worn and effete, silently disintegrating and utilizing them, or removing the useless parts of the body.

The first decided knowledge of bioplasm came by accident (if finding a thing we are not searching for can be called accident—is it not rather a revelation?), by ascertaining that when a piece of live tissue is immersed in a solution of carmine the bioplasm is stained, and the formed material is not stained. This discovery has enabled observers to find and watch this little workman, while busy in constructing every part of the body.

Bioplasm is the builder not only of the body, but of all animals and plants. To it every organized form, whether animal or vegetable, owes its formation and growth.

Bioplasm is a clear, colorless fluid, like thin mucus. Only microscopes of the highest power are of use in studying the substance, for the largest normal masses are not one-thousandth of an inch in diameter; but such microscopes fail to detect in it the least sign of organization. Yet this apparently unorganized substance is the cause of all organization. It is the medium through which dead, inorganic matter becomes living, organized.—*Boston Journal of Chemistry.*

THE HISTOLOGY OF SYPHILITIC TONSILS.

The microscopic anatomy of the syphilitic tubercular patches which are often seen upon the tonsils was the subject of a recent communication to the Paris Academy of Medicine by M. Cornil. The tubercles had been removed from the tonsils of patients, for the purpose of examination, without difficulty, and the wounds thus

produced had healed as readily as in an individual free from syphilis. He described, first, the structure of the "opaline mucous tubercle," a section of which, examined under a low magnifying power, shows thickened epithelium and hypertrophy of the papillæ, while the deeper connective tissue is thickened by infiltration with new cells. The superficial epithelial layer presents cells which possess a cavity around their nucleus. Often there are one or two globules of pus in the cavity instead of a nucleus. Further, within this superficial layer of epithelium, nests filled with globules of pus may be found—true abscesses excavated among the epithelial cells, and containing from four or ten to a hundred globules of pus. These little abscesses, are rounded or lenticular in shape, surrounded by cells flattened by compression, and are commonly situated on the surface of the tubercle, where they open from time to time. Thus, from the surface, a liquid transudes, containing many epithelial cells, with globules of pus among them, or collected in little abscesses between them, and the current of liquid which passes from the papillæ on the surface of the tubercle contains globules of pus. This is the cause of the opacity of the epithelial covering at the summit of the tubercle which gives it the opaline aspect.

The second variety examined was the ulcerated form. In this the epithelial covering is disintegrated by the large quantity of transuding liquid and the globules of pus which comes from the papillæ. The epithelial layer may fall off entirely, and then the inflamed papillary layer constitutes the base of the ulcer. Sometimes there is a true false membrane, grey, adherent and diphtheritic in character, over this ulceration. It does not contain, however, as in diphtheria, microscopic organisms, but the branching forms of the epithelial cells, the holes or cavities which they present, and which contain globules of pus, produce the same appearance as in diphtheria. In all cases, whether the tubercles are opaline or ulcerated, the closed follicles of the tonsil are inflamed, and the entire organ is hypertrophied. The peri-follicular lymphatic sinuses and the retiform tissue present a variable quantity of large cells, with one or several nuclei, containing red-blood globules. This lesion of the tonsils is identical with that which M. Cornil has lately described as found in glands in the first and second period of syphilis; so that he believes it to be correct to say that the syphilitic tonsils of the second period represent a papule upon a syphilitic gland.—*London Lancet.*

THE ABSORPTION AND EXCRETION OF WATER.

e absorption of water from the alimentary tract is a subject to which less attention has been directed than its practical importance deserves, for the subject is not so simple as might at first sight appear. Dr. Skorczewski, of Cracow, has made an interesting series of observations on the relation in time and quantity between the absorption of water and the excretion of urine, and his results have been published in a Warsaw journal. The observations were made upon men and rabbits, and in the latter provision was made to secure the urine as soon as it passed into the bladder. Spring water, soda water, and certain Russian mineral waters (those of Kyrnica and Iwonicz), were employed in the observations. The following conclusions were reached:

After the injection of spring water the quantity of urine did not increase immediately, in the case of either men or rabbits, but rose after a certain time, which is said to have been the longer the more water was taken. A longer period elapsed after the spring water than after the mineral water before the increase in the urinary secretion occurred; and the more spring water was taken the longer was this interval, and the more mineral water the shorter the interval. The increase in the urinary secretion reached its height sooner after the mineral water than after the spring water. The greatest total effect on the urinary secretion was obtained with soda water, the next with spring water, and the least with the mineral waters. The quantity of urine was in each case smaller than the quantity of water injected, with the exception of that which was saturated with carbonic acid. The difference between the total quantity of liquid taken and the total quantity of urine excreted was less after ordinary spring water than after the mineral water.

A second series of observations had for their object to ascertain the relation in time and quantity between the water absorbed and the urine excreted. This was effected by killing rabbits at certain periods after the water was injected into the stomach, the excretion of urine being observed in the same way as before.

From these observations it appeared that the increase in the ex-

cretion of urine did not commence until after the whole of the water had been absorbed, and in the case of both small and moderate quantities of water (40 to 100 c. cm.) a period of ten or fifteen minutes passed after all the water had been absorbed before the effect on the urine was apparent. It is calculated that 500 cubic centimeters of water is absorbed from the human stomach in fifteen minutes, and 200 c. cm. in five minutes. These results are true, however, only of spring water. Mineral water behaves differently. The increase in the excretion of urine occurs the earlier, the slower the absorption progresses. By the exclusion of certain possible causes for this difference, such as altered pressure in the abdominal cavity, direct irritation of the splanchnic nerve, or the effect of blood-tension, the conclusion is reached that the cause is the alteration in the blood consequent on the admixture with it of the saline substances in the mineral waters, the change in the blood acting as a stimulant to the vaso-motor nerves.

Whatever be the precise value of these researches, they show conclusively that the function of the stomach and kidneys may be materially affected by the presence of very small quantities of saline substances, and they indicate how much caution is necessary in applying rules true of pure water, to water which we are accustomed to consider as differing from spring water by very trifling qualities. As an instance of the practical importance of these facts, it is evident that the saline waters, so commonly taken with food, remain in the alimentary canal for a much longer time than spring water, and are capable, therefore, of disturbing in a greater degree the process of digestion.—*Ibid.*

THE TRANSPLANTATION OF TISSUES.

A series of systematic experiments on the transplantation of tissues has recently been carried out by Dr. Zahn. The first observations were made on the transfer of hyaline cartilage from one adult animal to another. The tissues into which the fragments were implanted were the subcutaneous connective tissue, the anterior cham-

ber of the eye, the submaxillary glands, the kidneys, the testicles, and the blood-vessels. These attempts yielded, however, negative results; the cells of tissue perished, the intercellular tissue persisted, but the fragment became encapsuled by connective tissue. The experiments were much more successful when the fragment was taken from fœtal cartilage, which showed a remarkable capability of developing in another organism, even in that of an adult animal. If some cartilage were rubbed up with amniotic fluid, the smallest quantity of the mixture produced, in about six weeks, nodules of cartilage the size of a lentil seed. On injecting the mixture into the jugular vein, numerous growths of cartilage were subsequently found in the lungs. The capacity of fœtal cartilage to develop is so great that these results were obtained, not only with animals of the same species, but even with those of different species. For instance, cartilage from the fœtus of the cat gave rise to nodules in rabbits. Experiments were also made with the cartilage from an enchondroma, with less uniform success than with fœtal cartilage, but with more success than with ordinary adult cartilage. In several instances the attempts to transplant it were successful. This is, it is hardly necessary to point out, a result of much interest in connection with the diffusion of enchondromatous growths. With other fœtal tissues Zahn was also successful. A piece of growing bone, for instance, became connected with the blood-vessels of the tissue into which it was placed and became nourished. Entire bones were even thus implanted, and, although they did not grow as a whole, they preserved their form, and outgrowths occurred—exostosis and enchondromata—at both the epiphyses and diaphyses. From these experiments, and those of previous investigators, Zahn concludes that only fœtal tissues, and such adult tissues as preserve their fœtal peculiarities, can develop in another animal, or in another part of the same animal. Only, for instance, the red marrow will do so, and the periosteum of young individuals. Such tissues alone possess the capability of persisting until they have come into relation with the new organism.—*Ibid.*

PHYSIOLOGICAL NOTES.

THE EFFECT OF GRAVITY ON THE CIRCULATION OF THE BLOOD.—It is a well-known fact that the amount of blood in the extremities undergoes considerable variations, and that the force of gravity especially affects it. A German observer, Herr Wolff, has recently studied this influence in a scientific way. He used five different methods of measuring the degree of fullness of the blood, but got available values only with three—namely, determination of the temperature in the closed hollow of the hand, with different positions of the arm; and two different measurements of the water displaced by the arm when immersed, the position of the arm being varied. The effect in question on the temperature of the hand was surprising. Thus, in a boy of eight, the temperature fell (on raising of the arm) in thirty-five minutes from 34.8° (Reaumur) to 31.2°, and again in an hour from 34.8° to 29.8°. In a man of twenty-two the raising of the arm brought the hand temperature from 29.5° to 28.6°. The arm being now hung down, the temperature rose fully 7° in twenty minutes. From the experiments with displacement of water it appeared that with raised arm the hand of an adult contained about twelve cubic centimetres less blood than with the arm hanging; the hand, fore-arm, and lower third of the upper arm had about 30 c. c. less.

REUNITING OF PIECES SEPARATED FROM THE BODY.—Dr. Maa describes two cases in which pieces separated from the body were replaced, and had united. In both cases the nose was the portion injured, and in both the epidermis sloughed off, leaving the rete Malpighii exposed. The pieces were sewed on with fine sutures, between which strips of adhesive plaster were applied, and, over all, oiled silk and cotton batting, to prevent evaporation and maintain warmth. The two following rules are given:

1. The piece separated must be kept warmed to the temperature of the human body.

2 It must be replaced, whether with sutures or adhesive plaster, or both, directly the flow of blood ceases.

The nutrition of the piece is supposed to be maintained by the speedy re-establishment of circulation through its vessels.—*Boston Journal of Chemistry.*

THE RESPIRATOR AS A PREVENTIVE OF COUGHS AND COLDS.

Dr. J. Milner Fothergill, of London, sends to the *Philadelphia Medical Times* a long letter on the treatment of coughs and colds. Among preventive measures he lays great stress on the respirator, which is much more commonly used abroad than here, and is undoubtedly a good thing for persons with sensitive lungs, if they can not or will not keep their mouths shut when out of doors in cold weather. On this subject Dr. Fothergill says:

"The mucous rheum which calls out the morning cough is due to the changes of temperature to which the lining membrane of the air-passages is exposed in cold weather. People pass rapidly from in-door temperatures of 60° Fahr. to out-door temperatures varying from 40° to 32°, and far below that very often, and then changes in the vascular supply of the mucous membrane of the air-passages are set up. If everybody at all times only breathed through the nose, the inspired air would be warmed by passing over the coils of blood-heated plates which exist in the nose for that purpose, and would not affect the air-passages placed behind the turbinated bones. But such is not the case; they probably commence to talk, and in doing so draw in by the mouth cold air, which, on mixing with the residual air in the chest, lowers its temperature, and then a fluxionary hyperæmia follows, and after it, in its train, a mucous rheum. The best plan for persons who thus catch their winter cough to adopt, is to keep their mouths closed; but then humanity is not generally prepared for such self-denial, and the respirator suggests itself as the agent required. A respirator is not an ornamental thing, and its appearance is not in its favor. Its use subjects you to the remarks of inconsiderate and unreflecting friends and acquaintances, who point significantly to the unsightly contrivance, and express their regret that you should be compelled to wear such a thing; and the insurance agent, when you call to pay the premium on your policy, looks excited and nervous. Having worn a respirator for eight winters now, and knowing how little I have been troubled with bronchitis since, which previous to then for some years had made winter a very uncomfortable season, I am

very little perturbed by such incidents, and reply that 'I don't wear a respirator because I am ill, but because I don't wish to be ill.' And a wonderfully comfortable thing it is! It keeps the cold wind from blowing into the mouth when facing it; and surely it is as natural to cover the orifice of the mouth in winter as it is to shut the front door to prevent a cold draught pervading the house. Ladies who take carriage-drives wrapped copiously in furs and provided with foot-warmers in their carriages and flasks of hot water in their muffs often catch cold when out. If they would further conserve and economize their body heat by the use of respirators, which take up some of the heat of the warm expired air and give it off again to the cold inspired air, then they would not only be more comfortable, but they would escape many a catarrh and much coughing. Whether it is consistent with the interests of the profession thus to instruct the public how to keep themselves well, or not, may not be affirmed. The respirator in some form has a great future before it.—*Ibid.*

PROCEEDINGS OF SOCIETIES AND SOCIETY NOTICES.

ACADEMY OF DENTAL SCIENCE.

The Eleventh Annual Meeting of the American Academy of Dental Science was held in Boston on Wednesday, October 30th, at the Hotel Brunswick.

There was a very good attendance, including many eminent member of the profession.

The meeting was called to order at half-past ten o'clock by the President, Dr. E. G. Tucker, who delivered a brief address of welcome, after which came the regular order of business.

Drs. G. L. Parmelee, of Hartford, Conn.; J. Adams Bishop, of New York, and L. Tracy Sheffield of New York, were elected members. Dr. Joseph E. Fisk, of Salem, Mass., was elected an honorary member.

The following gentlemen have been elected to membership during

the year: Drs. G. H. Ames and F. G. Eddy, of Providence, R. I.; F. H. Rehwinkle, of Chillicothe, Ohio; and C. A. Marvin, of Brooklyn, N. Y. Dr. Elbridge Bacon, of Portland, Maine, was elected to honorary membership.

Officers elected for the ensuing year:

President—Dr. E. G. Tucker.

Vice-President—Dr. J. L. Williams.

Recording Secretary—Dr. E. P. Bradbury.

Corresponding Secretary—Dr. E. N. Harris.

Treasurer—Dr. L. D. Shepard.

Librarian—Dr. J. T. Codman.

Board of Censors—Drs. T. H. Chandler, W. W. Codman, and D. M. Parker.

A communication was received from the Massachusetts Dental Society, inviting the Academy to meet with the other dental societies of New England in joint convention, to be held in the city of Boston in June, 1879. The invitation was accepted.

The following resolutions were presented, and, after discussion, were adopted.

Resolved, That the use of public prints for advertising pretended professional merit is derogatory to the dignity of the profession, and should be strongly discountenanced by its members.

Resolved, That among regular practitioners, any disparagement of their fellows to patients or the public, is a serious infraction of true ethics, tends to lower the profession in public estimation and to debase the individual detractor, and should be condemned by all who have the best interests of the profession at heart.

The Academy, having completed the routine business, took a recess until 2 P. M.

At 2:30 P. M. Charles W. Eliot, L. L. D., President of Harvard University, delivered the annual address before a large number of the profession, including many who were present by invitation of the Academy.

The following is but a brief synopsis of the address, which will soon be published in full. It was of an informal nature, delivered in an eloquent manner, and without notes.

President Eliot took for his theme "The Defects Apparent in the American System of Dental Education." He said that the development of the dental profession in the seventy years of its existence

in the United States had been remarkable; but as the development of a profession requires centuries, dentistry could not be expected to possess all the safeguards from injurious influences which have been attained by older professions.

The progress of dental science in this country not only has been extraordinarily rapid, but on the whole satisfactory, and the causes of this, the orator said, were the American inventive genius, the hospitality of the American mind to novelties, and the unphosphatic diet of which Americans are fond. Besides this, every cultured American visited a dentist twice a year, while an Englishman only went when his tooth pained him; the former sought relief for future time, the latter for the present.

Mr. Eliot then took up the question, Is there real ground for the anxiety which exists for the improvement of the status of the profession, and especially dental education? From the great increase in the number of dentists, and of patients, the increase in periodical literature and standard works, and the increase in the organized means of education, he thought there was real ground for that anxiety which manifests itself at the present day in dental literature and discussions.

The improvement must be brought about in a great measure through organized means for the education of the profession. Our dental schools demand no preliminary examination, while those of England require several university examinations, and this simple fact will in time determine the superiority of the profession in England.

He argued that besides the preliminary examination of candidates for admission, that the course of dental study should be three instead of two years long, and said a change in this direction is essential to the establishment of the dental profession on an equality with other professions. There should be no admission of the substitute of five years of practice for any portion of the period of study. There should be a certificate of attendance upon what may be called "private instruction," deposited in advance, and the practitioner granting such certificate should be required to show that he has proper facilities for instruction.

The exclusion of ignorant men from the profession was next discussed, the orator arguing that the proposition to secure this by means of a public registry, as in other countries, is not practical in

America; the people, or their representatives in legislative halls, are not competent to decide questions of science or of the higher education. Educated public opinion and not legislation would in time reduce the evil.

He commented unfavorably on the recent new departure of several reputable medical schools, which advertise to confer both the medical and dental degree for three years of study; and argued that as not more than three-fifths of the studies of these two courses were in common, and that as a three years' course was absolutely necessary to the medical degree, the two degrees could not be given in that period without lowering the standard of both. While he hardly expected at present that the large proportion of dental students would be educated in the thorough way of first obtaining the medical and then the dental diploma, he hoped that the efforts of the profession would be directed to the improvement and upraising of the dental schools.

He urged the profession to emulate the zeal of the medical profession in its research and scientific study, and also in their noble example of gratuitous practice. He advised the necessity of strict professional etiquette in dealing with patients of other practitioners, and spoke of the value of associated action of the profession in the common pursuit of common knowledge, and of the value of recorded experience and observation as a help to those coming after; and above all he placed the three aids—research, teaching, and gratuitous labor—as establishing and ennobling the profession.

The address was received with close attention; and at its close a vote of thanks to President Eliot, coupled with a request for permission to publish, was unanimously passed.

An essay by Dr. Henry S. Chase, of St. Louis, on "Filled Teeth as Galvanic Batteries," was read by Dr. G. T. Moffat, a letter having been received by him from Dr. Chase stating that he was unable to be present.

Dr. Chase, after announcing his belief in the theory of Dr. S. B. Palmer, of New York, that every tooth having a metallic filling was a galvanic battery, proceeded to recount several experiments made by himself which had convinced him of the truth of this theory. The conclusions arrived at were that dentos was positive to gold, gold and platinum, amalgam, tin, and lead. Each of these metals

united to dentos formed a battery, the power of which could be stated thus—

With gold and gold and platinum	100
" amalgam	66
" tin	50
" lead	30

With Hill's stopping there is no action, and with oxychloride of zinc the tooth became negative and the filling positive.

In concluding, he said that the perfect filling was yet to be discovered. It must not be negative to dentos; it must not be positive to dentos, and it must be plastic.

The essay elicited quite a lively discussion, after which the Academy adjourned, and the members with the invited guests partook of the eleventh anniversary dinner at 5 o'clock P. M., at the Hotel Brunswick.

EDWARD N. HARRIS,
Corresponding Secretary, 5 Park street, Boston.

OHIO DENTAL COLLEGE.

FIRST ALUMNI MEETING,

TO BE HELD IN CINCINNATI, THURSDAY, MARCH 6, 1879.

At the close of the last session of the Ohio College of Dental Surgery it was decided by those interested, who were present, to hold a reunion of all the alumni at the time of the next annual commencement when it is proposed to have every class that has ever gone out from the institution as fully represented as possible. The object of the reunion is to bring together the graduates of the college upon the Tercentenary Anniversary, that they may revive acquaintance and pledge themselves anew to give her that support and aid which enhances the usefulness of educational institutions.

A general committee, consisting of one member from each class, was appointed, whose duty it shall be to interest their respective classes in the meeting, and to furnish pithy biographical sketches of

deceased members. They will also give the leading items of interest pertaining to the classes, present location, status, etc., of the members; the reports to be made in the order of graduation.

The executive committee appointed will attend to all arrangements necessary for the success of the meeting and entertainment of those attending. It is earnestly desired that every one will respond to this call, and by his presence give assurance of continued interest in his time-honored Alma Mater.

GENERAL COMMITTEE.—A. Berry, of Cincinnati, Ohio, of class 1846; A. S. Talbert, Lexington, Ky., 1847; J. S. King, Pittsburg, Pa., 1848; E. Bray, Evansville, Ind., 1849; J. Ramsay, Springfield, O., 1850; J. C. Clark, Circleville, O., 1851; J. C. Whinnery, Salem, O., 1852; Joseph Richardson, Terre Haute, Ind., 1853; E. Collins, Little Rock, Ark., 1854; R. C. Reid, Anderson, Ind., 1855; E. Osmond, Cincinnati, O., 1856; H. A. Smith, Cincinnati, O., 1857; S. L. Bracy, Raymond, Miss., 1858; E. Ruth, Maysville, Ky., 1859; J. A. Watling, Ypsilanti, Mich., 1860; A. Evens, Hillsboro, O., 1861; Wm. Taft, Cincinnati, O., 1863; W. N. Morrison, St. Louis, Mo., 1864; J. J. Taylor, Cincinnati, O., 1865; C. C. Chittenden, Madison, Wis., 1866; Henri L. Ambler, Cleveland, O., 1867; J. P. Holmes, Terry, Miss., 1868; J. S. Cassidy, Covington, Ky., 1869; J. M. Porter, Toledo, O., 1870; J. E. Cravens, Indianapolis, 1871; J. H. Warner, Columbus, O., 1872; T. S. Hacker, Indianapolis, 1873; L. L. Dunbar, San Francisco, Cal. 1874; C. B Mower, Wooster, O., 1875; C. J. Keely, Oxford, O., 1876; A. L. Brown, Cincinnati, O., 1877; Thos. A. Stephenson, Cincinnati, O., 1878.

EXECUTIVE COMMITTEE.—J. Taft, chairman; J. S. Cassidy, H. A. Smith, E. G. Betty, secretary.

PROGRAMME.

Thursday, March 6, 1879, 2 P. M—Organization of meeting; calling the roll; miscellaneous business; historical address, Dr. George Watt, class 1854; reading of reports from general committees in the order of graduation.

The evening to be devoted to an entertainment, sentiments, toasts, etc.

Effort is being made by the Faculty to extend and render attract-

ive the Museum of the College. The co-operation of the alumni is earnestly desired in this work.

Donations of specimens and models of anomalous cases are respectfully solicited. Send to H. A. Smith, Dean, 286 Race street, when suitable acknowledgment and thanks for the same will be made.

MISSISSIPPI VALLEY DENTAL ASSOCIATION.

The thirty-fifth (35th) annual meeting of the Mississippi Valley Dental Association will take place in Dental College Hall, Cincinnati, O., on the first Tuesday in March, 1879, at 10 o'clock A. M.

OFFICERS.

President	Dr. Frank A. Hunter.
First Vice-President	" S. S Cassidy.
Second Vice-President	" J. W. Jay.
Recording Secretary	" E. G. Betty.
Corresponding Secretary	" C. J. Keely.
Treasurer	" J. G. Cameron.

E. G. BETTY, Secretary.

ST. LOUIS DENTAL SOCIETY.

At the annual meeting of the St. Louis Dental Society, a programme of meetings for the succeeding half year was adopted, which appears below.

The officers elected for the year 1879 were as follows:

President	H. J. McKellops.
Vice-President	J. Ward Hall.
Secretary	J. G Harper.
Treasurer	G. A Bowman.

C. W. SPALDING, Corresponding Sec'y, 1606 Olive st.

PROGRAMME.

January 7, 1879—Annual Meeting, office of Dr. Eames.

January 21, 1879—The Dental Pulp, W. H. Eames, office of Dr. Eames.

February 4, 1879—The Deciduous Teeth, their Office and the Necessity for their Preservation, C. W. Spalding, office of Dr. Spalding.

February 18, 1879—Our Failures, A. H. Fuller, office of Dr. Fuller.

March 4, 1879—Materials for Filling Teeth, Edgar Park, office of Dr. Park.

March 18, 1879—Replantation, J. Ward Hall, office of Dr. Hall.

April 1, 1879—Preservation *vs.* Dentalization of Pulps, N. C. Stark, office of Dr. Stark.

April 15, 1879—Treatment of the Deciduous Teeth, G. A. Bowman, office of Dr. Bowman.

May 6, 1879—Cleft Palates, H. H. Keith, office of Dr. Keith.

May 20, 1879—Prevention and Treatment of Dental Caries, J. B. Newby, office of Dr. Newby.

June 3, 1879—Our Duty to our Patients, J. G. Harper, office of Dr. Eames.

June 17, 1879—Irregularity—its Causes, I. Forbes, office of Dr. Forbes.

July 3, 1879—Closing meeting of the year, appointment of delegates, etc.

Practical Hints on the Use of the Electric Mallet and Dental Engine, H. J. McKellops, office of Dr. McKellops.

JOHN G. HARPER, Recording Secretary.

ANNUAL MEETING OF THE CALIFORNIA STATE DENTAL ASSOCIATION.—The Tenth Annual Session will be held in San Francisco, commencing Tuesday, May 13, 1879, at 10 o'clock A. M., and continue four days.

A DENTAL CONVENTION AT HOME.

BY GUSTAVUS NORTH, D. D. S., SPRINGVILLE, IOWA.

We are all within reach of what may be termed a Dental Convention at Home—a convention of which every member of the dental profession can become an active member, and be profited greatly at little expense.

Our State Dental Societies meet annually, and are generally well attended by the best men the profession affords.

We never attend a meeting of this kind that we do not return home doubly benefited—first, by the many new thoughts and ideas gained; and second, by the pleasure derived from meeting many honored friends. Justice to our patrons, to the profession and to ourselves makes it our duty to attend these gatherings. We can not afford to stay away.

Every member of our profession has it within his power to attend what we call a dental convention every month.

We established one many years ago, and each month brings forth a convention of thoughts presented through the columns of our periodical literature. The *Dental Register*, the *Missouri Dental Journal*, the *Cosmos* and *Dental News* attend our monthly meetings with great regularity, each bringing many delegates, who, as contributors, represent men of the highest character and attainments.

A convention of this class should convene monthly at every well regulated office. Professors Taft and Spalding, Drs. White and Wagoner will meet with you regularly, and right welcome visitors will they be, too, if we will only invite them, and pay our yearly tuition, which is much less than is required to pay the usual expenses incurred in attending the meeting of a State society.

A dentist cannot afford to be deprived of the valuable information gained from these monthly visitors.

Men are often judged by the company they keep; they may also be judged by the books they read.

A good library speaks well for any one, and it takes but a few years to accumulate many valuable volumes. Our dental journals

add greatly to a library, if they are regularly taken, and bound and preserved.

A man may qualify himself to fill many useful and important positions in life by placing himself in the current of knowledge, and by associating with those who appreciate his efforts, and who value him for his intelligence and integrity.

CORRESPONDENCE.

YOKAHAMA, JAPAN.

Editor Missouri Dental Journal:

The voyage across the Pacific was made in the City of Peking, Captain Caverly in command; thirteen cabin passengers, and one hundred and eighty Chinese in the steerage. We were twenty days out and nineteen of that without a speck of land in sight. For a few days the weather was cloudy, with heavy rains and wind, which made things look anything but pacific; at any rate that is the way it looked to me, though the officers pronounced it a fair passage.

A most grateful view to the eye is the verdure of the Japan hills, which is such an extreme contrast to the sun-parched sand-hills of California. Not having seen a ship or sail for eighteen days, the sight of hundreds of sails of quaint Japanese junks and fishing boats, manned with hundreds of naked savages, was enough to make one realize that he was indeed near a foreign shore.

The ship came to anchor in Yeddo bay, and we were taken to the shore in a "sam pan," sculled with crooked oars, by four Japs, who kept stroke with a hiss and a grunt. Their dress was of blue cotton, skin-tight, which made them fiend-like in appearance though the reverse in actions.

The Japan carriage is a Jinrikisha, and it is really one of the necessities of the country, for the roads and streets are so narrow, and there are so many people, children and dogs always in the way, that the foreigners and high officials who drive carriages or dog-carts have a man to run ahead of the horse to clear the way, and even with this precaution accidents frequently occur. I saw one

old man, of about fifty years of age, brought into the hospital with compound fracture of both legs, having been gone over by an American turn-out.

The people, as a race, are small, having coarse, black hair, brown skins and flat noses—beautiful they are not.

They bear evidences of pulmonary weakness, which their habits of exercise and dress, and the character of their dwellings, have every tendency to increase. Disagreeable rattling coughs are heard on every side.

Diseased and scarred scalps are largely in the majority.

Their teeth are good, comparatively regular, and tolerably free from decay, which I attribute to the simplicity of their diet (rice, with a little fish), and the frequency with which it is taken. It looked to me as though the average coolie could eat a quart of rice every two hours.

Japan is a beautiful field in which to observe the effects of a civilized or mixed diet upon the teeth, for they are rapidly cultivating a taste for everything foreign.

The married women, and in some parts of the empire unmarried ones also, stain their teeth black with powdered betel nut mixed with tea, and of course they cannot brush them thoroughly without taking it off, so that important performance is gone through with about once or twice a week. They also stain their upper eyelids with the same substance, laying it on with a small feather brush.

It is needless to add that these unbrushed mouths, filled with black teeth, under heads of hair redressed at about the same intervals, into the most meaningless and uncomfortable-looking-shapes, are, to speak within bounds and with due respect, *confoundedly disgusting*. Dr. H. M. Perkins, a Bostonian, is the only American dentist in Japan; resides in Yokohama, but visits other cities in the empire professionally at stated intervals. He enjoys a lucrative practice exclusively among foreigners. There are several Japanese, who have had American instruction, doing very creditable modern dentistry. The hahno-daiker-san (tooth carpenter) still exists. He makes no pretension toward preserving the natural teeth by fillings of any kind; extracts loose teeth or roots with his thumb and finger, punch and hammer, or primitive elevator. He carves a set out of wood from a wax impression and articulation combined, just from comparison and measurement, as he does not use plaster casts. If

the set is for a woman he stains the wooden teeth black, but if for a man the six front teeth, at least, must be of ivory or stone, let into the plate. A few brass tacks form the cusps of the back teeth—and a very clever substitute for masticators they are—all for the sum of two dollars and a half or three dollars.

Carpenters, tailors, blacksmiths and other artisans use their feet and toes to hold things while they are at work. They really possess the third hand so often wished for by some American members of the profession. Just imagine a clinic where the operator could hold the mouth open and rubber dam, etc., in position with his foot, and have both hands free for the insertion of his filling. Who would object to putting his foot into such a bonanza?

I have seen considerable of the country, from Nika to Nagasaka, and am forced to the conclusion that superior fabrics or works of art in lacquer, wood, bronze, etc., are not produced by superior talent, but by patient perseverance and cheap labor only. The people are weak physically, morally and mentally, and all foreigners who have grown rich by *so-called* trading with them should be made to restore, *fourfold*, for in reality it is like trading with children ten years of age. The great mass are poor—poor, indeed—and have but a little rice and fish in this world, and a very poor prospect for anything better in the next.

Yours truly, W. N. M.

GALVA, ILL., *Jan.*, 1879.

MR. EDITOR: In reading the proceedings of the Iowa State Dental Society, received through the courtesy of Dr. B. L. Cochran, of Burlington, Iowa, I am constrained to add my testimony to the many experimenters of the day. It had struck me as curious to see gold fillings failing by the side of amalgam, which was good and sound, and upon examination preserving the teeth perfectly, and which had been inserted previous to the gold. I, like others, had advocated gold in all cases, unless it were in an old shell that would not bear the pressure of gold. I went on in that way for years,

until I was aroused by the tests that had been made, and by the so-called new departure. Then I experimented as follows:

I filled a tooth with gold, *perfectly*, from the jaw of a man fifty-five years of age; tooth perfectly sound; was loose from a deposit of tartar, and had to be removed; enamel perfect. Drilled a cylinder shaped cavity and filled; dressed smooth to the edges of the enamel, and know that there was no fracture or abrasion which could assist the acid solution to penetrate. Then I selected a tooth from the jaw of a young lady, eighteen years of age, decayed to the nerve cavity. When thoroughly prepared, covered the anterior approximal and about half of the crown surface of the tooth with amalgam, and finished perfectly. They were immersed in separate vessels in a solution of cider vinegar, one part to twenty of water, and allowed to remain four days.

The result was a softening of the enamel around the gold for the space of one-sixteenth of an inch each way; the filling was a small one. Perhaps, if the filling had been larger, the disintegration of tooth structure would have been greater.

The tooth filled with amalgam was not affected in the least.

This, it seems to me, proves Dr. Harlan's theory a mistake. His test was filling one tooth with both metals and subjecting it to the test, and he thought that because the gold always failed that it was caused by the galvanic action between it and amalgam; but if he had tried them separately he would still have found the gold would fail.

I am now satisfied that gold is the best metal to fill with, when the conditions are favorable; and we may say with perfect safety that the conditions are always favorable, in the six superior front teeth, because they are never subjected to the same action of the secretions of the mouth as the others are. Besides, they are the most prominent in appearance, and hence always demand gold. But with regard to all the other teeth, if, after a test, the secretions present an acid reaction, anything would be better than gold for preserving the tooth structure, because of less galvanic action.

It will be said by many that this weak solution of acid would disintegrate the enamel if there was no metal in the teeth. While that is true, provided the tooth be subjected to it long enough, at the same time my test proves that the breaking down of tooth structure is greatest near the gold, for the opposite side of the tooth

was not affected—even the polished surface of enamel was not roughened, which proves that the breaking down began at the margin of the gold filling.

Taking into consideration the difficult manipulation of gold, and the lack of the proper attainments for the perfect working of that metal, with, I may safely say, two-thirds of those who are practicing dentistry, and the abnormal condition of the oral secretions in one-half of those who are in need of dental operations (acidity being the cause of decay), and also the galvanic action caused by gold when subjected to acid secretions, that something in the shape of an alloy that will not induce so much galvanic action, and yet be hard enough to withstand the pressure of mastication, would be better than gold, and better for the majority of those who need our work. I think if more judgment was used in the selection of materials for filling, and more attention paid to diagnosis, our patients would be better served.

C. R. WATT.

MISCELLANY.

THE ROLE OF LYMPH IN THE CICATRISATION OF WOUNDS.

In a paper read before the Societe Medicale du Haut Rhin, Prof Koeberle discussed the part played by lymph in the cicatrisation of wounds. He remarked that as long as the flow of blood continued that of the lymph was unobserved. Yet it is well known that in a cut which affects lymphatics as well as blood-vessels lymph continues to flow in spite of the exercise of an amount of compression sufficient to arrest hemorrhage. This exudation is only stopped when the occlusion of the lymphatics is complete. After a certain time, this liquid, at first very fluid, becomes plastic; it contains fibrine which undergoes coagulation, as may at any time be seen on wounds caused by vesicatories. On this account, therefore, lesions or cuts intersecting the lymphatics are more difficult than others to heal by the first intention. Moreover, the lymph easily becoming puriform gives rise to the sanies which, infiltrating the tissues, occasions

erysipelas, secondary hemorrhages, and other accidents consecutive upon a wound. This stagnation of the sanies is rendered evident by redness and pain occurring at some point in the line of the cicatrix. It then becomes necessary to allow of its escape by opening the wound at this point. Observation shows that in the middle line of the body, where there are few lymphatics, immediate union often occurs; and further, that longitudinal incisions, which do less injury to the lymphatics, heal better than horizontal ones. Professor Koeberle hence draws the conclusion that, when practicable, incisions should be made parallel to, and not across, lymphatic vessels.—*London Lancet.*

HOW TO AVOID LEAVING SCARS.

At a conversational meeting of the Philadelphia County Medical Society, November 13, 1878, it was addressed by Dr. John H. Packard on "Some Surgical Wrinkles." The first point he discussed was a method of making superficial incisions by which scarring can be avoided. In operations upon exposed parts, such as the face and hand, it is very desirable that they shall be so done as to leave as little scar as possible. The procedure recommended was first suggested by witnessing the effects of an accident, a lady having fallen while carrying a china dish, a piece of which made a long gaping incised wound in her hand, the sharp knife-like edge having cut through the skin very obliquely. The wound healed readily, almost without scar. A few weeks afterward the traces of the injury could scarcely be discovered.

Thinking that this effect was in great measure due to the direction of the incision through the skin, the speaker tried the experiment in cutting down upon a tumor of the thigh, holding the knife so as to divide the skin obliquely. The wound united perfectly, and after it had healed he actually could not find the line of incision. Since that time he had tested the idea in numerous other cases with highly satisfactory results. In small superficial operations, such as the removal of small tumors from the face, it has a cosmetic advantage that at once recommends it.

MANTEGAZZA'S GLOBULIMETRE.

This simple and ingenious apparatus consists of a cylinder for the reception of blood, a turning disk, and a stearine taper. The cylinder is supplied with glass windows. The disk has five round openings at its periphery, which are numbered in order: No. 1 is blank, and is marked plethora; No. 2 has four blue glasses, and is marked average in man; No. 3, nine glasses, marked average in woman; No. 4, fourteen glasses, marked slight anæmia; No. 5, twenty glasses, marked anæmia. The observer looks at the flame of the taper through the openings in the disk and the blood in the cylinder, and the condition of the blood is determined from the number of blue glasses that must be used before the flame becomes invisible.

The following is the method of investigation: A small vein in the hand is opened, and one cubic centimetre of blood is drawn by aspiration into a graduated pipette and emptied into a glass containing exactly 96 grammes of a solution of carbonate of soda (one part of soda to five parts of water). This is stirred briskly for a few moments and then poured into the cylinder. The disk is then attached to the cylinder, and the observer looks through opening No. 1 and the diluted blood at the flame of the candle, which is placed at a distance of one metre. The investigation must of course take place in a dark room. If the flame be invisible, the blood is plethoric; if visible, the observer turns the disk until opening No. 2 is before his eye; and so on until he can no longer see the flame. The inscription over the opening at which the flame becomes invisible gives the condition of the blood. For more exact investigation, a second disk or cylinder is supplied, on which any number of glasses, from one to forty, can be placed. As Prof. Mantegazza has determined, after careful and repeated experiments, that each blue glass corresponds to 125,000 red blood-corpuscles, it follows that the number of red corpuscles contained in a cubic millimetre of the given blood can be reckoned with great accuracy from the number of glasses required to hide the candle flame. The very slightest differences or changes in the blood of a patient can in this way be determined with but little expenditure of time and patience.

For ready reference, Prof. Mantegazza has prepared a table, giving the number of blood-corpuscles corresponding to each

combination of glasses from one to thirty. The following will serve as an example of the table:

0 glasses	5,625,000 red corpuscles		Plethora.
4 "	5,125,000 "		Average in man.
9 "	4,500,000 "		" woman.
14 "	3,875,000 "		Slight anæmia.
20 "	3,125,000 "		Anæmia.
26 "	2,375,000 "		Intense anæmia.

—Berliner klin. Wochenschrift, April 8th, in Medical Record.

"ARE THE ELEMENTS ELEMENTARY?"

Mr. Norman Lockyer has realized the alchemist's dream—the transmutation of metals. In the presence of a small party of scientific men, Mr. Lockyer, by the aid of a powerful voltaic current, volatilized copper within a glass tube, dissolved by the deposit formed within the tube in hydrochloric acid, and then showed, by means of the spectroscope, that the solution contained no longer copper, but another metal, calcium, the base of ordinary lime. The experiment was repeated with other metals and with corresponding results. Nickel was thus changed into cobalt, and calcium into strontium.

All these bodies, as is well known, have ever been regarded as elementary—that is, as incapable of being resolved into any components, or of being changed one into another. It is on this basis that all modern chemistry is founded, and should Mr. Lockyer's discovery bear the test of further trial, our entire system of chemistry will require revision. The future possibilities of the discovery it is difficult to limit. The great object of the old alchemists was, of course, to transmute base metals into gold, and so far as our knowledge goes there is no reason why copper should not be changed into gold as well as into calcium. The means at present employed are obviously such as to render the process far more costly than any possible results can be worth; but this is necessarily the case with most scientific discoveries before they are turned into commercial facts.

Mr. Locker is one of our best living spectroscopists, and no man with a reputation such as his would risk the publication of so startling a fact as he has just announced to the scientific world without

the very surest grounds. He is known by his friends as somewhat sanguine, and he does not pretend to be an accomplished chemist, but he was supported yesterday by some of our leading chemists, all of whom admitted that the results of his experiments were inexplicable on any other grounds but those admitting of the change of one element into another, unless indeed our whole system of spectrum analysis is to be upset, the other horn of a very awkward dilemma.

Since a hundred years ago Priestly discovered oxygen and founded modern chemistry there has been—there could be—no discovery made which would have such an effect on modern science as that the so-called elements were no longer to be considered elementary.—*London Daily News.*

On the subject of Mr. Lockyer's discovery the *Scientific American* remarks as follows:

THE TRANSMUTATION OF ELEMENTS.

Not a little nonsense has been written with regard to Mr Lockyer's recent assertion concerning the probable composite nature of possibly all, of the substances hitherto accounted elementary, and several, the probability that all the elements so-called are but varying phases of some fundamental matter-stuff.

It has been commonly assumed that if these assertions should be verified, the dreams of the alchemists would come true, and chemists would be able to change one form of matter into another, as lead into gold or silver. This assumption is altogether gratuitous. In his studies of the spectra of different substances under varying conditions of heat and pressure, Mr. Lockyer has indeed come to doubt the integrity of the elements as commonly understood; and to believe that substances as unlike as calcium, lithium, iron, and hydrogen, may be not only not fundamentally distinct, but that they may be merely different aspects of some basic matter-stuff, of which hydrogen is the simplest form at command. As yet, however, the evidence he has offered is far from convincing; and able chemists who listened to his paper before the Royal Society, among them Professors Roscoe, Williamson, Frankland, and Gladstone, are of

the opinion that he has merely demonstrated the presence of impurities in elements supposed to be perfectly pure.

But supposing these gentlemen to be wrong, and Mr. Lockyer right; supposing it true that all matter is fundamentally one—would we be any nearer to the practical realization of the alchemists dream?

If matter be at bottom only hydrogen or some still simpler substance, the existence of strongly marked phases of matter, like oxygen, iron, gold, and so on, can be explained only by supposing them to be the result of a process of natural selecting, operating through past ages, under conditions about which we can have but the vaguest knowledge.

We know that life in all its phases is fundamentally the same, yet those phases are in the main, so far as we are concerned, unchangeable, certainly not transmutable. Even if the common origin of the horse and the zebra should be demonstrated beyond the possibility of a doubt, we should be no better able to transmute zebras into horses than we are now. So if it be demonstrably true that two phases of one matter-stuff, like silver and lead, have resulted from the cosmical processes of material evolution, acting through the cycles of the past, the probability of our being able to change the one into the other would be scarcely greater than if they were fundamentally distinct. The chemical behavior of the different sorts of matter is quite independent of any theoretical notions with regard to the ultimate constitution of such substances; and chemistry will remain substantially what it is, whatever may be the outcome of the investigations of Mr. Lockyer and those engaged in similar work. By this we do not mean that the prevailing theories and p actices of chemists may not be materially changed—such changes are the necessary result of increasing knowledge—but simply that the popular talk about the radical overturning of the science, as the result of Mr. Lockyer's alleged discoveries, is sheer nonsense, even if his utmost expectation should be realized.

HIGH TEMPERATURE.

Mr. Seale, of Scarborough, brought before the Clinical Society of London a case in which the temperature reached 122° Fahrenheit; and yet the patient recovered.

In a series of experiments undertaken with a view to discover an effective method of preserving animal substances, Dr. B. W. Richardson discovered that flesh, which is alive in the body of an animal, possesses a neutral action, being neither acid nor alkaline; but that after an animal is killed, and the flesh is exposed to the air, there is quickly set up an acid reaction which lasts as long as the dead structure remains "fresh." As the structure begins to change, the acid reaction becomes neutral; and from that it soon passes to become alkaline. This alkaline reaction may be considered as an evidence of putrefaction.—*Popular Science Monthly.*

BOOK NOTICES AND BOOKS RECEIVED.

THE POPULAR SCIENCE MONTHLY, conducted by E. L. and W. YOUMANS, is filled with instructive and interesting articles and abstracts of articles, original, selected, and illustrated, from the pens of the leading scientific men of different countries; accounts of important scientific discoveries; the application of science to the practical arts; and the latest views put forth concerning natural phenomena, by *savants* of the highest authority.

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MECHANICAL DENTISTRY. A Practical Treatise on the Construction of the various kinds of Artificial Dentures, comprising also

useful formulæ, tables and receipts for gold plates, clasps, solders, etc. By Charles Hunter, Mechanical Dentist. Philadelphia: Lindsay & Blakiston. 1878.

An English work. Compared with text-books on Mechanical Dentistry of American origin and authorship, this volume must certainly take a subordinate rank. If the details of manipulation, as described in this work, are the best that are known and practiced in Great Britain, we think English dentists would be largely benefited by adopting American methods.

The work makes a very compact volume, and certain of the tables which it contains will be found convenient. The formulas are for the most part such as have given place in this country to others of later origin. The gold solders recommended are three to four carats lower in fineness than are the respective plates upon which they are to be used. This difference in fineness between plate and solder is unnecessarily great.

We doubt not that the defects existing in this edition will be remedied in a second whenever that issues from the press.

Dental Materia Medica.

Dental Materia Medica and Therapeutics, with Pharmacy. By James Stockton, L. D. S., R. C. S., England. Lindsay & Blakiston: Philadelphia.

This work is a valuable addition to our standard literature, and should be in the hands, not only of every student of dentistry, but also of every practitioner. As a work of reference the busy practioner will find it exceedingly convenient.

About two hundred articles belonging to general Medica Medica are described, and although less than one-half of these are ordinarily used in dentistry; yet a knowledge of them should be acquired by every intelligent practitioner. Dentists usually dispense their own medicines, but they sometimes find it necessary to write prescriptions.

We suggest that a table containing the old signs, and a detailed description of the rules and methods in writing prescriptions would add to the value of the book.

The Scientific American. This weekly paper, handsomely

and profusely illustrated, contains a large amount of useful information, and has for a long time occupied the foremost rank among the industrial publications of this country. In its columns is found a popular *resume* of select scientific information, which will well repay the general reader, and which is doubly interesting to all who wish to keep themselves informed of the progress that science and art are making in the industrial world. Terms, $3.20 per annum. Munn & Co., 37 Park row, New York.

HEALTH AND HOME. A monthly newspaper, edited by PRESTON SWEET, M. D., and published by CHAS. E. COOK & Co., No. 3 School street, Boston. One dollar a year. The promotion of good health, by disseminating knowledge concerning the laws of hygiene, is the chief leading feature of the paper. The number before us is entertaining as well as instructive.

VICK'S FLORAL GUIDE. Of the many Guides and Seed and Plant Catalogues sent out by our seedsmen and nurserymen, and that are doing so much to inform the people and beautify and enrich our country, we have seen none so beautiful and so instructive as *Vick's Floral Guide*. Its paper is the choicest, its illustrations handsome, and given by the hundred, while its colored plate is a gem. The work, although costing but five cents, is handsome enough for a gift book or a place on the parlor table. Published by James Vick, Rochester, N. Y.

COLMAN'S RURAL WORLD. For practical, and therefore useful information, concerning agriculture, horticulture, stock-raising, etc., etc., there is no paper published in the West that equals the *Rural World*, published in this city. We have had a large experience in horticulture, and speak advisedly when we say that any one who cultivates no more than a small garden will reap a profitable as well as an agreeable return for the investment of the small cost of this paper $1.50 per year, postage paid.

FIFTY YEARS AGO. An Address to the Graduating Class of the Medical College of the Pacific for 1878. By HENRY GIBBONS, Sr., M. D., Professor of the Principles and Practice of Medicine and Clinical Medicine. A review of the old-time practice of medicine.

FOURTH ANNUAL REPORT of the Officers and Superintendent of the Asylum at Walnut Hill, Hartford, Conn., for the Treatment of Inebriates.

THE NEW YORK UNDERWRITERS. A monthly magazine for the Promotion of the Common Interests of Assurers and Assured. Five dollars per annum. 89 Liberty street, New York.

INTRODUCTORY LECTURE OF PROF. E. C. FRANKLIN before the Homœopathic College of the University of Michigan.

PROCEEDINGS OF THE MEDICAL SOCIETY of the County of Kings, New York.

TRANSACTIONS OF THE DETROIT MEDICAL AND LIBRARY ASSOCIATION, January, 1879.

ANNUAL REPORT of the Pennsylvania Free Dispensary for Skin Diseases. Supported by voluntary contributions.

THE ILLUSTRATED ANNUAL OF PHRENOLOGY, AND HEALTH ALMANAC FOR 1879. S. R. Wells & Co, 737 Broadway, New York. Price ten cents. A very suggestive volume.

EDITORIAL.

Judge Wheeler, of the U. S. Circuit Court, Southern District of New York, has decided the case of Goodyear Dental Vulcanite Co. and Josiah Bacon *vs.* Adolphe P. Preterre, in favor of the plaintiffs The Court decides that—

To repair a dental plate made according to the Cummings patent (Reissue No. 1,904) by the substitution of a new for an old portion, with teeth embedded, is an infringement of the patent.

Such repairs, which in fact practice the entire invention (the patent not being confined to any size or shape of plate) distinguished from those cases wherein defective machine parts are corrected or changed without damage.

So, too, it is an infringement of the patent if the teeth be embedded in rubber according to its terms, although the remaining portion of the base-plate be made entirely of gold.

Celluloid and rose pearl held to be the substantial equivalent of the hard rubber or vulcanite in all essentials necessary to the successful practice of the invention, and their use a violation of the rights under the Cummings patent.

The facts established by the evidence in relation to such equiva-

lency being different from those appearing in Goodyear Cental Co. *vs.* Davis *et al.* (12 *Official Gazette*, 561) that case not deemed to be in point, although it delared the non-equivalent character of celluloid.

We incline to the opinion that the first two points covered by this decision are well taken, and will probably be sustained by the U. S. Supreme Court. That relating to the use of celluloid and rose pearl seems to involve an unwarrantable stretch of the rights conferred by the Cummings patent. For this reason we shall look for a reversal of that point in the decision.

The Cummings patent expires on the 7th of June, 1881. It is therefore not at all improbable that ths event may transpire before a decision on the above points are reached by the Supreme Court.

THE Dentists' Registry Act took effect in Great Britain at the beginning of the present year. All persons holding a licence or degree conferred by any of the medical authorities of the kingdom; all who were *bona fide* practitioners of dentistry at a given date, and all who hold foreign degrees, are entitled to register at this time, or at any time previous to the 1st of August next. After this date no one shall be entitled to take the name of dentist, or to practice dentistry in the United Kingdom, unless he is registered under this act, under a penalty not exceeding twenty pounds; and no one will be allowed to register after August who does not hold a proper licence or diploma.

The fifteenth of the month is the date on which the *Journal* is to be issued. In consequence of a change of both publisher and printer at beginning of the year, this nnmber is behind. No one can possibly be as much annoyed at the non-reception af the *Journal* as we have been at its non-appearance. The tardiness will be promptly corrected.

Printers are proverbially *promising*, and the printer of the *Journal* is one of the most *promising* in the craft. We are, therefore, not without hope of future amendment.

THE MISSOURI

DENTAL JOURNAL;

A Monthly Record of Dental Science and Art.

VOL. XI.—FEBRUARY, 1879.—No. 2.

FOUL BREATH.

(An Essay read before the joint meeting of the Mass. Dental Society and the American Academy of Dental Science. Boston, Jan., 1879. Published by vote of the latter Society.)

BY J. T. CODMAN, D. M. D.

The subject of which I propose to treat to-day is not an inviting one. It is shunned by most writers, and articles treating of it in dental journals are very rare. The question naturally arises in our minds, what is the reason of this almost total neglect of this very important topic, which, if not one absolutely belonging to our specialty, is one so intimately connected with it that it should interest every member of it.

I cannot but think that the neglect is occasioned by want of that knowedge of its primary causes, and a lack of general knowledge of the relation of all the organs, one to another, that work together for the sustenance and maintainance of the life and health of our corporate frames; and that this want pervades both the dental and medical professions.

For what other reason could such an important subject be ignored? Does it not intrude itself upon us everywhere—in the

street, in the coach or car in which we travel, and in our homes? Are we not annoyed at every turn—at the place of amusement, at the church and the lecture? Ofttimes we meet the intelligent and the able, the profound and the artistic. They may have earnest and noble faces; their conversation be rapt and energetic; but we turn away in disgust from the foul odor that comes in the same breath with words of affection, of wisdom and love. Are not our hearts pained within us, and is not our pity even greater than our disgust for the unfortunates who are thus afflicted? Must they not know that we turn away from them, and that they are shunned for no other reason than this of impure breath?

The love of purity and sweetness is inherent in our natures. It is impossible for us to remain in the closest intimate relation of personal friendship or love with those who belch forth foulness. There must, in such cases, be personal and mental reservation. A sweet breath, then, becomes a fortune and a blessing, and woe to the pretty face! woe to the loving heart! woe to the striving one who longs for higher position, for more of love or more of caress! who has it not.

But, as a class, whom doth it annoy more than the dentist, who, hour after hour and day after day, earns his bread by bending over the "gateway of life"—the breathing places of human beings—taking to his central vitality the putrid odors that emanate from the unsounded depths of foulness? But, alas for the weakness of humanity! the truth, and the whole truth (for it must be told) is, we who criticize are not exempt from this plague. Verily, have I not been offended beyond measure, in dental meetings and among dentists, by dentists themselves? Therefore should we attend to this subject; therefore should we wake from our sleepiness and supineness for our own good, and, curing ourselves, be ready to go forth to cure all others.

It being a subject connected with the primary functions of life and health, it is necessary to know something of primary functions, to understand the mode of cure; for it is a disease which unfortunately afflicts all occasionally, from the infant to the oldest person; and the paucity of knowledge of the philosophy of physiology must be the reason of the neglect of its cure.

Doubtless the causes of bad breath are numerous. Temporarily, it may be produced by any nauseous or ill-flavored thing, either chewed or used as food, as garlics, onions, snakeroot, tobacco, etc.,

etc., or equally by bad-odored drinks, by simple apposition to the teeth and mouth, by diseases of the teeth—common caries—with the odor of decaying tooth substance and the remnants of food left within the cavities getting foul, also by diseased gums, which emit a peculiarly unpleasant smell.

All these troubles are embraced within one cause, which cause itself is a reason for foul breath ; namely, want of cleanly habits ; and all yield to judicious treatment—first, by simply paying attention to cleanliness, by washing the mouth and teeth, having the cavities filled, foul roots extracted, and the diseases of the gums cured. After these are attended to there yet remain a large multitude of persons who are afflicted, and from whom all hope of cure has fled, as much as if they had entered the Inferno, over whose gates the inscription reads, to leave all hope behind ; persons who have no more idea of any cause, of their affliction, by any act of theirs, than they have of the causes of special high tides or the color of the skin of the negro.

We find, in approaching our subject, without going deeper into it than the limits of our time admit, that we must seek for the cause of the odor in emanations of the glands placed along the mucous tract, from its commencement to its close, and, of course, more particularly those of the mouth, throat, and nasal passages. We may also seek for it in the air from the lungs, as an emanation from the blood itself, concentrated and condensed on the air passages by the passing of the air through the respiratory track.

These two sources are sufficient to account for all the trouble, and we need not seek for other causes, even though there may be others ; for, if we understand the philosophy of the cause of disease in these parts, we probably shall be able to understand it in all other parts of the system.

In examining the condition of health, we find that the system may, in its relation to food, be divided into three separate functions : First, the mouth, teeth and glands, salivary, tonsilary, etc., which are concerned in the preparation and passage of the food into the stomach, may be termed *organs* of preparation or *reception.* Second, the stomach and a portion of the alimentary canal, with the pancreas, liver and surrounding viscera, may be termed the organs of *assimilation;* and third, the remainder of intestinal canal

and the kidneys, with their related organs, may be called the organs of *excretion.*

I maintain that the functions of each organ are strictly marked; that never, under the conditions of absolute health, does one organ interfere with, or accept even, the duties of another; but that, in an overworked or diseased condition of an organ, some other one may assist it in its duties, perform a portion of them, or, perhaps, for a time, the whole of its functions, as for instance, the skin, which, at a venture, we will say should only secrete a lubricating fluid for protecting its surface and adjusting the heat of the body, *may* carry off through its pores the emanations that more properly belong to the kidneys, bladder or intestines. This "interchange of function," well known to physiologists, assists us in understanding our subject; for, if my premises are right, all the impurities of the system should be removed by the *organs* of *excretion,* and will be so removed when they are in a state of health.

What is a state of health? The human system is like a furnace. The food we eat is the fuel. The stomach and the mouth are the cooks and wood-choppers, who prepare the fuel, and the air is the flame that burns it, blown on by the bellows, the lungs. Along the intestinal tract are workmen that throw out the ashes of the burnt fuel into the gut that carries by its slow movement the rejected matter to the verge of the system. Let those workmen be disabled or overworked; let the motions of the rejecting canal be retarded, and the constantly accumulating secretions must find other outlets: an interchange of function takes place and, through the skin and through some of the portions of the mucous tract, the essential poison is poured out; similar organs taking on themselves more easily the interchange of function. The presence of disorganized matter is positively known by the smell. I take this as a fact not to be disputed, that where there is an ever present disagreeable odor there must be disagreeable, or in other words, *poisonous matter* present; matter that should be eliminated, and which is detrimental to health, and, therefore, the organs containing it are in a state of disease.

But here I am met with the objection that some persons are entirely well, with the exception of foul breath, and I must account for that condition separately. Doubting the fact I will, however, try to do so.

Every human being has a certain amount of vitality—some more sòme less. *Great vitality signifies great fire, active lungs*, active motions of blood, stomach, heart, bowels and brain. Everything eaten is appropriated, and is burned to ashes; not alone what is best for sustenance, but what is *poor* for sustenance; whatever is put in for fuel. As in the great Boston fire, six years ago, woolen goods burned like oil, and the very slates and the granite itself were burned to ashes. But such vigorous natures are *rare*. Some fires burn slowly. They do not even consume the purest elements of combustion, and cannot burn what is ordinarily non-combustible; and, therefore, such things must be got rid of in some other way if they are placed within the system.

Want of power, then, or weakness in the organs of assimilation, stands first in the way. If the stomach is not able to discharge easily the duty put upon it, irritation of the mucous membrane takes place, which rapidly extends over its surface. What is meant by extending over its surface? It means that the irritation that would be dangerous or fatal to the vitality of the membrane if confined to one spot or, more strictly speaking, to the mucous cells that compose the special surface irritated, by the power of cell contact, or by the intrinsic incorporated power in the cells themselves, distribute the disease or the irritation more widely, thereby reducing its power over any one spot or section of mucous surface.

We have always to remember that irritation produces an *increase of activity*. If a surface is in the condition of secreting any given fluid, slight irritation increases its secreting power. If the irritation is greater, inflammatory action takes place whieh may reverse the glandular action and, for a time, the secretions may give way to feverish or heated conditions; but we must always remember, and place it as the *corner stone* of our investigations, *that disease is the manifestation of an attempt on the part of nature to cure some ailment.* It is the process of work to rid the system of injury and affliction.

We will take the case of an overloaded stomach for illustration. Persons who are liable to chronic bad breath will have it come on under such a condition. An hour or two after eating a tainted breath is noticed: it increases rapidly and constantly until the stomach appears to be entirely empty. Even then it may continue and increase, but, if fasting is continued long enough, it disappears and purity returns.

I have said that the organs below the stomach should perform all the acts of secretion. If they perform their nominal functions thoroughly, there will not be any taint of breath ; for the food, after remaining in the stomach a certain length of time, will be passed from it into the small intestines, where all unfinished processes will go on to their completion, or it will rapidly be passed to the more especially excretory organs ; but with the greater portion of persons, who live on the average diet of Americans who reside in our cities, with their sedentary habits and want of vigorous labor or play, this is not the case. The fire which should burn brightly, that should burn all fuel to clean ashes, smoulders and smokes, and the mucous membrane, which cannot absorb the weighty *debris* of the system, nevertheless endeavors to assist in carrying off the superfluous load. It does this by a vicarious exchange of function, taking a share of the work, by carrying off some of the smoke and foul gases produced by the imperfect combustion, or, in other words, imperfect digestion, and the fermentation of more food than the stomach can wrestle with.

The proper balance of diet in its vegetable, animal, and mineral constituents will, as far as diet is concerned, produce health; but it is necessary that all the surplus that is not retainable as nourishment and fat be thoroughly eliminated from the system ; but to do this the excretory organs must be in *active working condition.* It must not be necessary to coax them to perform their duties, but they should be in condition to command obedience with a force that must be at once obeyed.

If these organs are not capable of this duty, and cannot fulfil it completely, some portion of the *debris* must remain in the system ; and as it is poison, as it contains in itself the elements of death, it cannot be stored in any one organ without danger of fatal sickness.

Nature by the same mode of interchange of function distributes it throughout all the organs that possess any excretory powers. She loads the blood with it ; she lines the air-passages of the lungs with it : she forces it out through the skin. Wherever she can oxydize it she tries to do it : for that destroys its action. But where it accumulates in large amounts, it is liable to a sort of spontaneous combustion, attacking veritable tissue—and especially the delicate tissues of the lungs—burning and destroying them like a fire.

Things at first unattackable, get involved: heat produces heat: the firm tissues that resist ordinary attacks burn, and the currents of the blood like untoward winds scatter the firebrands through the whole organization. This is consumption; but mark this important fact, for it is probable that you hear it announced for the first time, that pulmonary *consumption is a secondary disease, the primary cause of which is defective excretion*, and it has its primary seat in the excretory organs. When physicians adopt this view of mine and direct their observations to this cause, they will find that there is a *cure* for this dreadful disease.

I said Nature loads our blood with *debris*. How do I know it? By the fact that it can be smelled in the blood. The normal blood has an odor but not the rank, disagreeable smell we sometimes find coming from the blood of some wounded persons. To the mucous membrane she seems to have delegated, when necessary, the province of carrying off first bad odors and secondarily mucous deposits.

I have spoken of this as an interchange of function; but when we consider that the mucous membrane lines the whole intestinal track, the whole internal, preparative, assimilative and excretive track, as far as the alimentary canal is concerned, and that the mucous membrane of the bowels is so intimately connected with the excretion of *highly offensive odors*, the office may be said to be one of the normal duties of that organ or membrane.

Whether my theories are correct or not, it is a fact that certain habits will bring on and continue foul breath, and I am convinced that the largest cause is found in constricted, irregular and costive habits of bowels, and that for its cure particular attention to regulating this portion of the system is absolutely necessary.

The next cause, and intimately connected with the other, is overloaded and dyspeptic conditions of the stomach. This fact is easily demonstrated. Let any one who has the tendency to inflamed condition of the mucous coat of the mouth, throat and surrounding parts, eat an over-full meal of even the simplest substances, under conditions that do not favor the digestion of it, and it will bring on the trouble. A hearty meal just before bed-time, will probably produce it during the night, so that on awakening in the morning the mouth will be noticeably dry and foul. So also will the tend-

ency be kept up by *too frequent meals*. It were better that we all had an interval of six hours between each meal. The stomach should have time to rest, and food must have time to digest: articles taking *five* hours time *cannot* be digested in *four* hours, and no new food should be mixed with the partly digested material. This, I am sure, is one of the *most fruitful causes* of inflamed mucous membrane and bad breath.

But if the presence of food at the wrong seasons and in over quantities produces trouble, how much more so will wrong food in great quantities stimulate and produce it! I cannot do better than to refer any one interested, to the well known tables of digestion founded on Dr. Beaumont's experiments with Alexis St. Martin, for the only positive knowledge we have of digestion in the live, human stomach, and also to his "experiments," crude and unmethodical as I think they often were, as proving some important facts regarding inflammation produced by various substances, foods, condiments, &c. A large essay could be written on this single point of our subject, but I can only glance at it.

Spices and heating condiments, as a rule, should be avoided. Under certain circumstances they may be used as medicine, but as food, and as pleasurable excitants by one who has the tendency named, they should be shunned. Let me give the reason *why*; for I am sure I have never heard it properly given. Spices form compounds with animal and vegetable substances, thereby retarding or preventing decay; or in other words they prevent the rapid separation of food into soluble parts, and being able to do it outside of the system, will, in the same manner, prevent rapid digestion in the food receptacles, which is a process not entirely unlike decomposition—the first process of decay. Let me advance a step further and give a *rule of digestion* discovered by myself. *Rule: All articles of food easily decomposed by warmth and moisture out of the human stomach are easily digested in the stomach; and all articles which are slow to decompose under such circumstances, are slow of digestion; the ratio of digestive process being proportionate to the process of decomposition.*

This rule holds good with some few exceptions.

Large quantities of fluids are irritants to some persons, by *floating food* and preventing digestion. I am certain that fluids are often difficult of absorption, and remain in the stomach a long while,

probably from some inaction of the secretory glands. I refer to the simple fluids, such as *water*, *milk*, *soup*, *etc.*: but the presence of stimulating drinks, as rum, brandy, gin, etc., have a well-known effect, and will produce, almost immediately in some cases, by irritating the mucous membrane, a bad taste in the mouth and bad breath.

I have spoken of the bad odor of the breath being a sort of *smoke* of *unburnt food*, but the continuance of this disease is, I am sure, always accompanied by phlegm and catarrhal troubles. When the membrane cannot discharge from itself the load that is placed upon it, it clogs up and the secretion becomes viscid and abundant. It attaches itself to the surface in a ropy, adhesive mass. It is a carbonaceous deposit, and would indicate, it seems to me, the presence of too much carbonaceous matter in our food, that the system is trying to get rid of; and I suggest that the diet should be deprived of a portion of such matters, in the form of grease, butter and milk, and that in their places be substituted fruits, or peas, beans, and green vegetables, or what is better still, if one can get exercise or vigor to digest them, turnips, radishes, celery, and all the anti-scorbutics.

I must here mention one other cause of trouble: the presence of unmasticated food, half-chewed, bolted, gobbled down, any way it can be got into the stomach. Observation leads me to think that nine-tenths of the trouble arising from the use of various articles of food *denominated unhealthy*, is from want of *proper mastication*; and I would also lay down this rule to parents: *Rule—If you want your children healthy, teach them to chew their food fine and eat slowly.* Do you think they can learn it themselves? So can they learn to read and write, to comb their heads and brush their teeth; but how much better can they do these things with instruction! And why should the important instruction in chewing food be neglected? Is it not more important than music or dancing, or the infantile theology that is so much taught, or the molecular theory taught to my twelve-year old girl?

Everything that *disturbs the digestion*, either from *internal* or EXTERNAL *causes* will *prevent* the cure of this disease. *Want of exercise, too much worry and mental strain*, too much sensuality, all conspire to prevent the physiological fires from consuming the fuel without smoke.

To those to whom this disease comes as an affliction, we must tender our regrets: they can study the hints here thrown out; they can know they have our sympathies; but from those who nasty their mouths by their own filth—by uncleanliness, by vile and dirty habits, we must withhold them. We are members of a profession that teaches cleanly habits, and to make our teachings effectual we must be cleanly ourselves. Lenient as I am, and as I hope all of us may be to such, I cannot conceive how any dentist can approach his patients with a befoulment of fresh garlic, onions or tobacco in his mouth; but disagreeable as this is or may be to most persons, it is yet weak and unobnoxious compared with the nastiness of garments and mouth filled with the stale, second-hand odors of strong cigars or pipes that some of my friends are in the habit of using, and I am sorry to say that they are as innocent of their faults in this respect as babies. Let me draw you a picture.

Some years ago I knew a young dentist who smoked tobacco. He did it genteely. He smoked a very mild-flavored cigar. He drove into the city, and when he arrived at his office, he put away his garments carefully, and he thought he disguised the habit from his patients: they did not complain. He did not desire to surrender the habit, and he did not wish to offend his patients. *He thinks he does just the same thing now!* I doubt that any one here could convince him to the contrary, and he will think that I am joking, and do not, cannot mean him, so slowly has the vile habit crept on him. To-day he smokes a stinking thing; rank, outrageous, which is an offence to good taste, decency and manners. He should mount to his attic and there fume away if he must; but no, he will stand and blow his villainous smoke square in your face. He forgets good taste and walks the street with a cigar in his mouth; and when he enters the presence of ladies he carries with him a feeling of disgust and a nasty smelling breath, that is as hard for *them* to bear as some of the breaths of his *highest flavored patients* are for *him*. What excuse is there for such a man who outrages decency in such a manner, and talks to his patients loudly about brushing their teeth and keeping their mouths clean? There is just one man worse than this one. It is he who adds this befoulment to an already stinking breath.

But I must sum up my remarks and then close, first noticing the fact that there is an important item yet to be investigated; and that

is whether foul breath is a disease which is catching, or can be conveyed from one to another. I am of the opinion that it is. In a system without any tendency that way, the over-laden breath may pass into the lungs from another person and no bad results be noticed; but as is probably the case in conditions favoring diseases of this sort, there are spores or seeds of disease, or there are *vibriones*—minute animal life floating in air and feeding on, as well as producing diseased conditions that may pass from mouth to mouth and breed the same disease by contact in another system. I have had one or two attacks of disordered mucous membrane after working for persons of peculiarly foul breath; and although I cannot say positively that I can trace it to that cause, I am and have been seriously suspicious that it had much to do with it.

I have not in this essay proposed any course of medical treatment; and yet in some cases I have no doubt that a mild purgative or cathartic would assist temporarily in removing the trouble; but my theory of medicine is, that if the articles we call medicines, which consist to a great extent of concentrated bitter herbs, could have been supplied with our food, i. e., if they had not been purged from our food, or the portion of food producing the same effect in the natural way been taken from our diet, we should go along pretty well without purgatives of any sort.

But what palliative shall the dentist have who, when bending over his patient, suddenly discovers that there is an unpleasant taint on his breath? The first thing he must do, and as a rule, *do it always*, when working for a patient, is to *close his mouth tight and breathe through his nose.* Have at hand some disinfectant, as lime-water and chalk, chlorate of potash in solution, or in the dry powder, Burnett's milk of magnesia or some other good mouth wash, and every chance he can get, make for the remedies, rinse the mouth rapidly and silently and run back to his patient, and keep his mouth closed. Another remedy or palliative is to keep the mouth wet with fresh saliva. This can be done by chewing some inodorous thing, a piece of paper, wood, or better still, a small piece of gum elastic: the flood of new saliva will temporarily drown out the excretions. Do not use snake-root, cardamon seeds and similar drugs, for the remedy is often as bad as the disease: rinse with cool water, and try the bit of elastic gum, taking it out when your patient has gone.

Cure the disease if you can! This is important. *Increase* your *vigor* by *exercise*, and *abstinence* as well. PLAY!! I wish we Americans could *play*. Play ball as a *frolic*, and not as hard work; not at the risk of broken fingers and bunged eyes, but for the *fun* of the thing, and *dance*. Inhale and exhale the pure air: oxydize the food and blood: *that* will kill the odors.

What result but a *fatal* one must come from the inhalation of our own diseased *emanations*? Hour by hour, day by day, and night by night drawing in with each breath such horrid odors, what but consumption will result from it?

I know not if any statistics can be found on the subject, but I will venture to say that continuous foul breath must finally increase the consumptive tendencies of those who have it, and for two reasons. First, it shows a weak tendency in the individual, and, secondly, it will react on itself by returning the odors with their poison into the system.

Let me finish here, by asking the members of our profession to give more attention to this important subject, by thanking you for your attention, and by urging you not to accept superficial answers to inquiries on all physiological questions, but to think for yourselves and not be satisfied with the mere outward descriptions of organs, but to go further and construct a *philosophy of physiology*, as I have tried to do, which shall be as a map for you by which you shall see the way of the workings of nature in the human system, and make normal and diseased action plain and simple.

It will give me pleasure, some time, to explain to you how far I have satisfied myself on this subject, and what points are in doubt, in my mind; but I have satisfied myself that the *philosophy* of physiology is extremely simple.

NECROSIS.

A CASE BY GEORGE A. CHRISTMAN, D. D. S., CHICAGO.

As I have never read a report of a case of Necrosis, similar to the one Dr. Deschauer and myself had under treatment, it may interest some of the readers of the *Journal* to hear something of its course.

About the middle of last June Mr. Max Stern, 33 years of age, an active business man and owner of a printing establishment, came to my partner, Dr. Deschauer, for consultation. His gums, palate and cheek along the right sup. maxilla, and also the mucous membrane of the nose, were enormously swollen, and the two incisors together with the cuspidatus on that side, so completely detached from their respective alveoli, that it could not be expected that they would ever become firm again, and Dr. D. concluded to extract them at once.

With a probe it was easily ascertained that the alveolar process was in a rough and necrosed condition. The patient was questioned, but from his answers no assignable cause could be given that would have justified the establishment of a diagnosis: the patient said he had almost a constant pain in the orbital region, which at times became so severe that it was unbearable, and nothing would relieve him in such attacks but hypodermic injections of morphia.

Having been troubled with this affection for about three years, he was at different times under the treatment of eminent physicians in this country, and also went to Europe for the purpose of consulting physicians there, but all their efforts were attended with failure to relieve him of his suffering.

A fetid discharge from the right nostril, together with pain along the orbit on that side, led to the belief that some antral affection might have caused the trouble, and, as the crown of the first r. sup. molar was carious, it was also extracted for the purpose of making an opening into the maxillary sinus. This was done through the socket of the posterior buccal root. A cannula was introduced, through which injections were made: as however no pus escaped from that cavity, and in probing no marked sensation was felt by the patient, this course of treatment was soon discontinued. Meanwhile the necrosed part was syringed with stimulating and antiseptic agents three times daily.

Within three to four weeks the process of separation from the adjacent living tissues was accomplished, and three good sized sequestra, with many small pieces of *dead* bone were at different times removed. The exfoliation extended up to the nasal crest of the jaw, and from the left central incisor to the first r. bicuspid,

leaving the root of this last named tooth deprived of its natural covering on the anterior surface almost to the apex.

It was hoped the disease would stop here. However, not more than four weeks after this another large swelling appeared, quite disfiguring his face, and especially the upper part of his nose being swollen to an alarming extent. At this period the patient took a severe cold, which effected him so much that he was confined to his bed for a whole week. The pain along the lower margin of the orbit was at this time more severe than ever before.

As on the right side of his nose a decided fluctuation was felt, an incision was made through the integument at the point of the nasal bone. A probe was carried through this opening, and both the nasal bones, as also the perpendicular plate of the ethmoid, were found in a rough and necrosed state. Pus had worked its way through the entire osseous framework of the nose, so that the probe could be distinctly felt in the soft structure on the opposite side, if inserted on the one, through the opening.

As soon as some pieces of bone became loose (and, as these could not be removed without much enlarging the original incision), the chemical power on bone of the æquous solution of sulphuric acid was greatly relied on.

Every time, before syringing, the necrosed parts were cut and scraped by means of a chisel and excavators: the small particles of bone so made loose were washed out through the nostrils. After all the exfoliated bone had been removed by this method, nature began to repair these parts, and, as this went on, the cannula that had been inserted for the purpose of not alllowing the opening to close was removed.

Of the severe pain first spoken of, the patient has not complained for the past four months, and he was discharged last week as cured. The large space left on the jaw was replaced by an artificial denture, and nothing abnormal can be seen in his features, except a very small scar where the opening was made.

THE DISCOVERY OF ARTIFICIAL ANÆSTHESIA.

BY OUR ENGLISH CORRESPONDENT.

There is a great difference between doing a thing and almost doing it. The variation in the amount and quality of work done in two given cases may be so little as to be inappreciable to ordinary minds, while the effect in one case will be trifling, and in the other result in infinite good and everlasting fame. A powerful illustration of this may be seen in the discovery of anæsthesia. Sir Humphrey Davy suggested its possibility by means of nitrous oxide, but yet no one took the hint. But a still more remarkable escape from the great discovery left to Horace Wells is on record in a book entitled "Dr. Syntax in Paris," published about the year 1820. The venerable and eccentric gentleman was in search of the grotesque, and found it. Among other places he paid a visit to the Catacombs in company with Dolly, his wife, and on their emergence,

* * "Dolly cries, 'My jaws do burn!
I've caught the toothache from the damp,
So to a doctor let us tramp.'

'Here lives, my dear, a skillful man,'
Said Syntax, 'called Le Charlatan.'

* * * * * *

Le Charlatan, with knowing grin,
Welcomed his patient, heard her case,
Received his fee and took his place.'

* * * * * *

Our dentist quickly twisted out
The offending tooth, and Dolly rose.
Le Charlatan observed 'Suppose,
Madam, you sniff some nitrous gas
To assuage the torments of your face.'"

She consented, and the pair were ushered into a room where people were taking the gas with the usual exhilarating effects. There cannot be a doubt that this description of Le Charlatan and

his proceedings was drawn from facts; and that either in London or Paris—probably the former city, although the scene is laid in the French capital, some person united gas administration with tooth-drawing. Having got the idea of easing the pain *after* the extraction, it is almost incomprehensible how any man, however ignorant, should not have thought of giving it *before* the operation. Yet more astonishing is the fact that among the many thousand readers of Dr. Syntax's exploits—for the work had great popularity in its day—no one gave any indication of having caught the suggestion so broadly given. The way to account for that mental blindness which prevents the perception of what lies directly before the eyes is the undue prevalence of that negative condition of mind, affected by so many people on the east side of the Atlantic as the acme of human perfection. This state is the result of about equal parts of conceit and indolence. The first creates unaffected amazement at the intimation that there can be any wisdom not already possessed. And the latter causes every new thought and invention to be resented as a wicked intrusion on the sacred domain of vested interests. Where the affirmative triumphs over dormancy, it leads to investigation and perception of new ideas. And this explains why America has heretofore led, and will continue to lead in the advancement of dentistry, as well as in other things.

THE BEGINNING OF NERVES IN THE ANIMAL KINGDOM.

BY GEGRGE J. ROMANES.

Nerve-tissue universally consists of two elementary structures, viz., very minute nerve-cells and very minute nerve-fibres. The fibres proceed to and from the cells, so in some cases serving to unite the cells with one another, and in other cases with distant parts of the animal body. Nerve-cells are usually found collected together in aggregates, which are called nerve-centres or ganglia, to and from which large bundles of nerve-fibres come and go.

To explain the *function* of nerve-tissue, it is necessary to begin by explaining what physiologists mean by the term "excitability." Suppose that a muscle has been cut from the body of a freshly-killed animal; so long as it is not interfered with in any way, so long will it remain quite passive. But every time a stimulus is supplied to it, either by means of a pinch, a burn, an electrical shock, or a chemical irritant, the muscle will give a single contraction in response to every stimulation. And it is this readiness of organic tissues to respond to a suitable stimulus that physiologists designate by the term "excitability."

Nerves, no less than muscles, present the property of being excitable. If, together with the excised muscle, there has been removed from the animal's body an attached nerve, every time any part of this nerve is stimulated the attached muscle will contract as before. But it must be carefully observed that there is this great difference between these two cases of response on the part of the muscle—that, while in the former case the muscle responded to a stimulus *applied directly to its own substance*, in the latter case the muscle responded to a stimulus applied *at a distance from its own substance*, which stimulus was then *conducted* to the muscle by the nerve. And in this we perceive the characteristic function of nerve-*fibres*, viz., that of conducting stimuli to a distance. The function of nerve-*cells* is different, viz., that of accumulating nervous energy; and, at fitting times, of discharging this energy into the attached nerve-fibres. The nervous energy, when thus discharged, acts as a stimulus to the nerve-fibre; so that, if a muscle is attached to the end of a fibre, it contracts on receiving this stimulus. I may add that, when nerve-cells are collected into ganglia, they often appear to discharge their energy spontaneously; so that in all but the very lowest animals, whenever we see apparently *spontaneous* action, we infer that ganglia are probably present. Lastly, another important distinction must be borne in mind—the distinction, namely, which I now draw between muscle and nerve. A stimulus applied to a nerveless muscle can only course through the muscle by giving rise to a visible wave of contraction, which spreads in all directions from the seat of disturbance as from a centre. A nerve, on the other hand, conducts the stimulus without undergoing any change of shape. Now, in order not to forget this distinction, I shall always speak of muscle-fibres as conveying

a *visible* wave of *contraction*, and of nerve-fibres as conveying an *invisible* or *molecular* wave of *stimulation*. Nerve-fibres, then, are functionally distinguished from muscle-fibres—and also from protoplasm—by displaying the property of conducting invisible, or molecular, waves of stimulation from one part of an organism to another, so establishing physiological continuity between such parts, *without the necessary passage of contractile waves.*

Such being the structure and the function of nerve-tissue in its fully evolved form, I will now proceed to give the results of my researches on the structure and function of nerve-tissue where this tissue is first found to occur in the ascending series of animal life. The animals in which it so occurs are the *Medusae*, or jelly-fishes, which must be familiar to all who frequent the seaside. These animals present the general form of a mushroom. The organ which occupies the same position as the stalk does in the mushroom is the mouth and stomach of the medusa, and is called the polypite; while the organ which resembles in shape the dome of the mushroom constitutes the main bulk of the animal, and is called the swimming-bell. Both the polypite and the swimming-bell are almost entirely composed of a thick, transparent and non-contractile jelly; but the whole surface of the polypite, and the whole *concave* surface of the bell, are overlaid by a thin layer, or sheet, of contractile tissue. This tissue constitutes the earliest appearance in the animal kingdom of true muscular fibres. The thickness of this continuous layer of incipient muscle is pretty uniform, and is nowhere greater than that of very thin paper. The margin of the bell supports a series of highly contractile tentacles, and also another series of bodies which are of great importance in the following researches. These are the so-called marginal bodies. Lastly, it may not be superfluous to add that all the *Medusæ* are locomotive. The mechanism of their locomotion is very simple, consisting merely of an alternate contraction and relaxation of the entire muscular sheet which lines the cavity of the bell. At each contraction of this muscular sheet the gelatinous walls of the bell are drawn together; the capacity of the bell being thus diminished, water is ejected from the open mouth of the bell backward, and the consequent reaction propels the animal forward. In these swimming movements systole and diastole follow one another with as perfect a rhythm as they do in the beating of a heart.

Previous to my researches, the question as to whether or not the *Medusæ* possess a nervous system was one of the most vexed questions in biology, some eminent naturalists maintaining that they could detect microscopical indications of nervous tissues, and others maintaining that these indications were delusive—the deliquescent nature of the gelatinous tissues rendering microscopical observation in their case a matter of great difficulty. But amid all this controversy no one appears to have thought of testing the question by means of physiological experiments as distinguished from microscopical observations. Accordingly, I made the experiment of cutting off now one part and now another part of a jelly-fish, in order to see whether by so doing I conld alter the character of its movements in such a way as to show that I had removed nerve-centres or ganglia. The results which I obtained were in the highest degree astonishing. For, on removing the extreme margin of the swimming-bell, I invariably found that the operation caused immediate, total, and permanent paralysis of the entire organ. That is to say, if, with a pair of scissors, I cut off the whole marginal rim of the bell, carrying the cut round just above the insertion of the tentacles, the moment the last atom of the margin was removed, the pulsations of the bell instantly and forever ceased. On the other hand, the severed margin continued its pulsations with vigor and pertinacity, notwithstanding its severance from the main organism. For hours, and even for days, after its removal the severed margin would continue its rhythmical contractions; so that the contrast between the death-like quiescence of the mutilated bell and the active movements of the thread-like portion which had just been removed from its margin was a contrast as striking as it is possible to conceive.

I may here add that, although excision of the margin of the bell thus completely destroys the *spontaneity* of the bell, it does not at all diminish the *excitability* of the bell; so that, although the mushroom-shaped mass will never move of its own accord after having been thus mutilated, it will give any number of locomotor contractions in response to an equal number of artificial stimulations, just in the same way as a frog with its head (nerve-centres of spontaneity) removed will give any number of hops in response to successive stimulations.

These experiments, therefore, prove conclusively that, in the ex-

treme marginal rim of all the numerous species of *Medusæ* which I examined, there is situated an intensely localized system of nervous centres, to the functional activity of which the rhythmical contractions of the swimming-bell are exclusively due. And as the *Medusæ* are thus the lowest animals in which a nervous system has yet been, or probably ever will be discovered, we have in them the animals upon which we may experiment with the best hope of being able to elucidate all questions concerning the origin and endowments of primitive nervous tissues. I may here add that these experiments were independently made by Dr. Eimer, of Wurzburg.

After I had made the observation which I have described, it seemed to me desirable to follow it up with a number of physiological, as distinguished from histological, researches. For I was much struck by the certainty and precision of the results which I had obtained by experiment, as distinguished from the uncertainty and disagreement of the results which had previously been obtained by the histological methods. Accordingly, I decided, in the first instance, to feel my way in the direction of physiological experiment before beginning that systematic histological research which, sooner or later, it was manifestly imperative to make. Study of function having so far guided the study of structure as to show that it was in the margin of the *Medusæ* that we must look for the principal if not the exclusive supply of central nervous tissue, it seemed desirable to ascertain how much light a further study of function might throw on the character and the distribution of the peripheral nervous tissue.* Accordingly, I began my physiological work chiefly with the view of guiding my subsequent histological work.

But, as the physiology of the subject continued to open up in the wonderful way in which it did, I felt it was undesirable either, on the one hand, to suspend this part of the inquiry, or, on the other hand, any longer to defer a thorough investigation of the histological part. I therefore represented the case to my friend Mr. Schafer, who very kindly consented to join me in Scotland, with the view of co-operation with me in the researeh. The histological results which

* Although it sounds somewhat paradoxical to speak of the central nervous tissue as distributed on the periphery of a circular animal, and of the peripheral nervous tissue as occupying all the more centrally situated parts, the paradox is unavoidable.

he has obtained from a most skillful and painstaking investigation are in the highest degree interesting. He worked chiefly with *Aurelia aurita*, and found that the tissue which performs the ganglionic function in the marginal bodies is of the nature of modified epithelium-cells, the ganglionic function of which could scarcely have been suspected but for the paralyzing effects which are produced by their excision. From these marginal ganglia there radiate what he regards as delicate, pale nerve-fibres, which sometimes present the appearance of fibrillation. These fibres spread over the entire expanse of the muscular sheet in great numbers. It will thus be seen that these microscopical researches by Mr. Schafer fully bear out my inference from the result of physiological experiments, which was previously published at the Royal Society—the inference, namely, that the entire muscular sheet of *Medusæ* is overspread by a dense plexus of nervous channels. But these researches of Mr. Schafer tend to negative another inference which was published at the Royal Institution—the inference namely, as to the degree in which these channels are *differentiated*.* As the facts on which this inference was based have not been previously published in the *Fortnightly Review*, and as, apart from the dubious inference, they are facts of the first importance, it is necessary that I should here very briefly restate them. The bell of *Aurelia aurita*, when fully expanded, is about the size of a soup-plate, and in it all the ganglia are collected into eight marginal bodies, as proved by the fact that on cutting out all the eight marginal bodies paralysis of the bell ensues. Therefore, if the reader will imagine the bell to be overspread with a disc of muslin, the fibres of which start from one or the other of these marginal ganglia, he will gain a tolerably correct idea of the lowest nervous system in the animal kingdom. Now suppose that seven of these eight ganglia are cut out, the remaining one then continues to supply its rhythmical discharges to the muscular sheet of the bell, the result being, at each discharge, two contractile waves, which start at the same instant, one on each side of the ganglion, and which then course with equal rapidity

* I may here state that, previous to Mr. Schafer's researches, I had observed both the tissue-elements which he describes; but I hesitated to pronounce upon their nervous character. It will thus be understood that even now, without wishing to dispute the accuracy of his judgment in this matter, I do wish it to be known that the responsibility of this judgment rests entirely with my friend.

in opposite directions, and so meet at the point of the disk which is opposite to the ganglion. Suppose now a number of radial cuts are made in the disk, according to a plan wherein every radial cut deeply overlaps those on either side of it. The contractile waves which now originate from the ganglion must either become blocked and cease to pass round the disk, or they must zigzag round and round the tops of these overlapping cuts. Now, remembering that the passage of these contractile waves is presumably dependent on the nervous network progressively distributing the ganglionic impulse to the muscular fibres, surely we should expect that two or three overlapping cuts, by completely severing all the nerve-fibres lying between them, ought to destroy the functional continuity of these fibres, and so to block the passage of the contractile wave. Yet this is not the case; for, even in a severely cut specimen of *Aurelia*, the contractile waves, starting from the ganglion, continued to zigzag round and round the entire series of sections.

The same result attends other forms of section. For instance, seven of the marginal ganglia having been removed as before, the eighth one was made the point of origin of a circumferential section, which was then carried round and round the bell in the form of a continuous spiral—the result, of course, being a long, ribbon-shaped strip of tissue with the ganglion at the end, and the remainder of the swimming-bell at the other. Well, as before, the contractile waves always originated at the ganglion; but now they had to course all the way along the strip until they arrived at its other extremity; and, as each wave arrived at that extremity, it delivered its influence into the remainder of the swimming-bell, which thereupon contracted.

Now, in this experiment, when the spiral strip is only made about half an inch broad, it may be made more than a yard long before all the bell is used up in making the strip; and as nothing can well be imagined as more destructive of the continuity of a nerve-plexus than this spiral mode of section must be, we cannot but regard it as a very remarkable fact that the nerve-plexus should still continue to discharge its functions. Indeed, so remarkable does this fact appear, that to avoid accepting it we may well feel inclined to resort to another hypothesis—namely, that these contractile waves do not depend for their passage on the nervous network at all, but that they are of the nature of muscle-waves, or of

the waves which we see in differentiated protoplasm, where all parts of the mass being equally excitable and equally contractile, however severely we cut the mass, so long as we do not actually divide it, contractile waves will pass through the whole mass. But this very reasonable hypothesis of the contractile waves in the *Medusæ* being possibly nothing other than muscle-waves, is negatived by another fact of a most extraordinary nature. At the beginning of this article I stated that the distinguishing function of nerve, consists in its power of conducting stimuli to a distance, irrespective of the passage of a contractile wave; and I may here add that, when a stimulus so conducted reaches a ganglion or nerve centre, it causes the ganglion to discharge by so-called "reflex action." Now, this distinguishing function of nerve can plainly be proved to be present in the *Medusæ*. For instance, take a section of *Aurelia*, wherein the bell has been cut into the form of a continuous parallelogram of tissue with the polypite and a single remaining ganglion at one end. Now, if the ends of the nervo-muscular sheet most remote from the ganglion be gently brushed with a camel's-hair brush—i. e., too gently to start a responsive contractile wave—the ganglion at the other end will shortly afterward discharge, as shown by its starting a contractile wave at its own end of the paralellogram, thus proving that the stimulus caused by brushing the tissue at the other end, must have been conducted all the way along the parallelogram to the terminal ganglion, so causing the terminal ganglion to discharge by reflex action. Indeed, in many cases, the passage of this nervous wave of stimulation admits of being actually *seen*. For the numberless tentacles which fringe the margin of *Aurelia* are more highly excitable than is the general contractile tissue of the bell; so that, on brushing the end of the parallelogram remote from the ganglion, the tentacles at this end respond to the stimulus by a contraction, then those next in the series do the same, and so on—a wave of contraction being thus set up in the tentacular fringe, the passage of which is determined by the passage of the nervous wave of stimulation in the superjacent nervous network. This tentacular wave is here represented as having traversed half the whole distance to the terminal ganglion, and when it reaches that ganglion it will cause it to discharge by reflex action, so giving rise to a visible wave of muscular contraction passing in the direction opposite to that which the nervous or tentacular wave

had previously pursued. Now, this tentacular wave, being an optical expression of the passage of a wave of stimulation, is a sight as beautiful as it is unique; and it affords a first-rate opportunity of settling this all-important question, namely—will this conductile or nervous function prove itself as tolerant toward a section of the tissue as the contractile or muscular function has already proved itself to be? For, if so, we shall gain nothing on the side of simplicity by assuming that the contractile waves are merely muscle-waves, so long as the *undoubtedly nervous* waves are equally able to pass round sections interposed in their path. Briefly, then I find that the nervous waves of stimulation are quite as able to pass round these interposed sections as are the waves of contraction. Thus, for instance, the tentacular wave of stimulation continued to pass as before, even after I had submitted the parallelogram of tissue to a tremendously severe form of section. And this fact, I am not afraid to say, is one of the most important that has ever been brought to light in the whole range of invertebrate physiology. For what does it prove? It proves that the distinguishing function of nerve, where it first appears upon the scene of life, admits of being performed vicariously to almost any extent by all parts of the same tissue-mass. If we revert to our old illustration of the muslin as representing the nerve-plexus, it is clear that, however much we choose to cut the sheet of muslin with radial or spiral sections, one could always trace the threads of the muslin with a needle round and round the disk, without once interrupting the continuity of the tracing; for, on coming to the end of a divided thread, one could always double back on it and choose another thread which might be running in the required direction. And this is what we are now compelled to believe takes place in the fibres of this nervous network, if we assume that these visible fibres are the only conductive elements which are present. Whenever a stimulus-wave reaches a cut, we must conclude that it doubles back and passes into the neighboring fibres, and so on, time after time, till it succeeds in passing round and round any number of overlapping cuts.

Now, it was in view of this almost unlimited power of vicarious action on the part of the fibres composing the (then) hypothetical nervous plexus, that I was in the first instance inclined to suppose these nerve-fibres to be of a non-fully differentiated character; and although the above detailed experiments, and others of a similar

kind, proved that an intimate network of such channels was present, I scarcely expected that they would admit of being distinguished by the microscope. But, not to give an inference the value of a fact, I was careful to state in the publication where this inference was adduced—viz., in the printed abstract of a Royal Institution lecture—that this position was only "provisional," and that, until I should have had "time to conduct a systematic inquiry concerning the histology of the *Medusæ*," the inference in question must be regarded as premature and uncertain.* Such a systematic inquiry has now shown that this provisional inference was perhaps erroneous, and that, in any case, when stained with gold, some of the nervous channels show themselves in the form of fully differentiated nerves. Now this fact, it is needless to say, greatly enhances the interest of the previous experiments. If, as I formerly said, the proof of vicarious action being possible to an almost unlimited extent in these incipient nerve-fibres appeared to me one of the most interesting among the additions to our knowledge of invertebrate physiology, much more interesting does this proof become if we further learn that these incipient nerve-fibres are only incipient in the sense of constituting the earliest appearance of nerve-fibres in the animal kingdom. For if these *true* nerve fibres admit, from the peculiarly favorable plan of their anatomical distribution, of being proved to be not improbably capable of vicarious action to so extraordinary a degree, we may become the more prepared to believe that nerve-fibres elsewhere are similarly capable of vicarious action But the interest does not end here, for Mr. Schafer's numerous preparations all show the highly remarkable fact that the nerve-fibres which so thickly overspread the muscular sheet of *Aurelia* do not constitute a true plexus, but that each fibre is comparatively short, and nowhere joins with any of the other fibres. That is to say, although the constituent fibres of the network cross and recross one another in all directions—sometimes, indeed, twisting around one another like the strands of a rope—they can never be actually seen to join, but remain anatomically isolated throughout their length. So that the simile by which I have represented this nervous network—the simile, namely, of a sheet of muslin overspreading the whole of the

* I guarded the inference in this way, lest the fibres in question should afterward prove to be nerves; and it will therefore be observed that, supposing them to be nerves, the above inference cannot be negatived until it is shown that there are no other nervous channels present of a less differentiated character.

muscular sheet—is as a simile even more accurate than has hitherto appeared; for just as in a piece of muslin the constituent threads, although frequently meeting one another, never actually coalesce, so, in the nervous network of *Aurelia*, the constituent fibres, although frequently in contact, never actually unite.

Now, if it is a remarkable fact that in a fully differentiated nervous network the constituent fibres are not improbably capable of vicarious action to almost any extent, much more remarkable does this fact become when we find that no two of these constituent nerve-fibres are histologically continuous with one another. Indeed, it seems to me that we have here a fact as startling as it is novel. There can scarcely be any doubt that *some* influence is communicated from a stimulated fibre *a* to the adjacent fibre *b* at the point where these fibres come into close apposition. But what the nature of the process may be whereby a disturbance in the excitable protoplasm of *a* sets up a sympathetic disturbance in the anatomically separate protoplasm of *b*, supposing it to be really such—this is a question concerning which it would as yet be premature to speculate.* But if, for the sake of a name, we call this process, whatever it may be, a process of *physiological induction*, we may apply a similar name to a process which seems closely analogous to, if it is not really identical with, the process we are now considering. I refer to some highly remarkable observations which were published a year or two ago in Mr. Darwin's work on "Insectivorous Plants." It is there stated that, while looking at a linear series of excitable cells with the microscope, Mr. Darwin could observe the passage of a stimulus along the series, the protoplasm in the cells immediately stimulated first undergoing aggregation, then the protoplasm in those next adjacent doing the same, and so on. Now, the protoplasm in each cell was separated from the protoplasm in the adjacent cell by the walls of both the cells; yet, notwithstanding there was no observable anatomical continuity between these masses of protoplasm, a disturbance set up in any one of the series of masses, immediately set up, by some process of physiological induction, a sympathetic disturbance in the immediately adjacent masses.

This, then, is one case that seems to be comparable with the

* That it can scarcely be an *electrically inductive* effect would seem to be shown by the fact that such effects can only be produced on nerves by strong currents; and also by the fact that the saline tissues of the swimming-bell must short-circuit any feeble electrical currents as soon as they are generated.

case of physiological induction in the nerve-fibres of *Aurelia*, and I think it may be well for physiologists to keep awake to the fact that a process of this kind probably takes place in the case of these nerve-fibres. For it thus becomes a possibility which ought not to be overlooked, that in the fibres of the spinal cord, and in ganglia generally, where histologists have hitherto been unable to trace any anatomical structural continuity between cells, and fibres, which must nevertheless be supposed to possess physiological or functional continuity—it thus becomes a possibility that in these cases no such anatomical continuity exists, but that the physiological continuity is maintained by some such process of physiological induction as probably takes place among the nerve-fibres of *Aurelia.*

Before quitting the histological part of the subject, it is desirable to state that at about the same time as Mr. Schafer's work was communicated to the Royal Society, two other papers were published in Germany on the same subject. One of these papers was by Messrs. Hertwig, and the other by Dr. Eimer. Both memoirs display a large amount of patient research, and describe the character and distribution of the nervous tissues in various species of *Medusæ.* These authors, however, do not describe the nervous network which has been described by Mr. Schafer. I may add the interesting fact that the nervous tissues in *Medusæ* appear to be exclusively restricted to the body-layer which is called the ectoderm, and which is the structural homologue of that body-layer in which the nervous tissues of all the higher animals are known to have their origin during the life-history of the embryo.

Proceeding now to state some further results of various physiological experiments, I shall begin with the department Stimulation. And first take the case of a physiological principle which I observed in the jelly-fish, and which has also been found to run through all excitable tissues. If a single stimulation is supplied to a paralyzed jelly-fish, a short period, called the period of latency, will elapse, and then the jelly-fish will give a single weak contraction. If, as soon as the tissue has relaxed, the stimulation is again repeated, the period of latency will be somewhat shorter, and will be followed by a somewhat stronger contraction. Similarly, if the stimulation is repeated a third time, the period of latency will be still shorter, and the ensuing contraction still stronger. And so on up to nine or ten times, when the period of latency will be reduced to its *minimum*

while the force of the contraction will be raised to its *maximum*. So that in the jelly-fish the effect of a series of excitations supplied at short intervals from one another, is that of both arousing the tissue into a state of increased *activity*, and also of producing in it a state of greater *expectancy*. Now, effects very similar to these have been found to occur in the case of the excitable plants by Dr. Burdon-Sanderson; in the case of the frog's heart by Dr. Bowditch; and in the case of reflex action of the spinal cord by Dr. Sterling. Indeed, the only difference in this respect between these four tissues, so widely separated from one another in the biological scale, consists in the *time* which may be allowed to elapse between the occurrence of the successive stimuli, in order to produce this so-called summating effect of one stimulus upon its successor: the *memory*, so to speak, of the heart-tissue, for the occurrence of a former stimulus being longer than the memory of the jelly-fish tissue; while the memory of the latter is longer than that of the plant-tissue. And I may here add that even in our own organization we may often observe the action of this principle of the summation of stimuli. For instance, we can tolerate for a time the irritation caused by a crumb in our throats; but very rapidly the sense of irritation accumulates to a point at which it becomes impossible to avoid coughing. And similarly with tickling generally, the convulsive reflex movements to which it gives rise become more and more uncontrollable the longer the stimulation is continued, until they reach a maximum point, where, in persons susceptible of this kind of stimulation, the muscular action passes completely beyond the power of the will. Lastly, I may further observe, what I do not think has ever been observed before, that even in the domain of psychology the action of this principle admits of being clearly traced. Who, for instance, has not felt it in the case of the ludicrous? We can endure for a short time, without giving any visible response, the psychological stimulation which is supplied by a comical spectacle: but if the latter continues sufficiently long in a sufficiently ludicrous manner, our appropriate emotion very rapidly runs up to a point at which it becomes incontrollable, and we burst into an explosion of ill-timed laughter. But in this case of psychological tickling, as in the previous case of physiological tickling, some persons are much more susceptible than others. Nevertheless, there can be no doubt that, from the excitable tissues of a plant, through those of a jelly-fish and a frog, up to

even the most complex of our psychological processes, we have in this recently discovered principle of the summation of stimuli a very remarkable uniformity of occurrence.

Hitherto light has never been actually proved to act as a direct stimulus to ganglionic matter. It is therefore of interest to note that it thus acts in the case of some species of *Medusæ*. *Sarsiæ*, for instance, almost invariably respond to a single flash by giving one or more contractions. If the animal is vigorous, the effect of a momentary flash thrown upon it during one of the natural pauses is immediately to originate a bout of swimming; but if the animal is non-vigorous, it usually gives only one contraction in response to every flash. That it is light *per se*, and not the sudden transition from darkness to light, which here acts as the stimulus, is proved by the result of the converse experiment, viz., placing a vigorous specimen in sunlight, waiting till the middle of one of the natural pauses, and then suddenly darkening. In no case did I thus obtain any response. Indeed, the effect of this converse experiment is rather that of inhibiting contractions; for if the sunlight be suddenly shut off during the occurrence of a swimming-bout, it frequently happens that the quiescent stage immediately sets in. Again, in a general way, it is observable that *Sarsiæ* are more active in the light than they are in the dark: it appears as though light acts towards these animals as a constant stimulus. Nevertheless, when the flashing method of experimentation is employed, it is observable that the stimulating effect of the flashes progressively declines with their repetition. The time during which the deleterious effect of one such stimulus on its successor lasts appears to be about a quarter of a minute. The period of latent stimulation is, judging by the eye, as short in the case of luminous as in that of other stimulation; but when the efficacy of luminous stimulation is being diminished by frequent repetition, the period of latency is very much prolonged.

The question as to what part of the organism it is which is thus susceptible of luminous stimulation, was easily determined by detaching various parts of the organism and experimenting with them separately. I thus found that it is the marginal bodies alone which are thus affected by light; for, when these are removed, the swimming-bell, though still able (in the case of

*Sarsia**) to contract spontaneously, no longer responds to luminous stimulation; whereas, if only one marginal body be left *in situ*, or if the severed margin, or even a single excised marginal body, be experimented on, unfailing response to this mode of stimulation may be obtained.

Responses to luminous stimulation occur in all cases equally well, whether the light employed be direct sunlight, diffused daylight, polarized light, or any of the luminous rays of the spectrum employed separately. On the other hand, neither the non-luminous rays beyond the red, nor those beyond the violet, appear to exert the smallest degree of stimulating effect. Hence, in all respects, the rudimentary eye of *Sarsia* appears to be affected by the same qualities of light as are our own.

Not so, however, in the case of another species of medusa, which I have called *Tiaropsis polydiademata*. This jelly-fish responds to luminous stimulation in the same peculiar manner as it responds to all other artificial—as distinguished from natural ganglionic—stimulation; that is to say, instead of giving a locomotor contraction of the bell, it throws the bell into a violent contraction of a long-sustained character, resembling cramp or tonic spasm. Now, in the case of this medusa, the luminous stimulation requires to act for a comparatively long time in order to produce a response. For, while in *Sarsia* the period of latent stimulation appears to be as short in the case of luminous as it is in the case of other modes of stimulation, in the case of *Tiaropsis* this is not so, although, as regards all modes of stimulation other than luminous, the latent period is as brief in the case of *Tiaropsis* as it is in the case of *Sarsia*. In other words, while this period is quite as instantaneous in the case of *Tiaropsis* as it is in the case of *Sarsia* when the stimulus employed is other than luminous, in response to light the characteristic spasm does not take place till slightly more than a second has elapsed after the first occurrence of the stimulus. Now, as my experiments on *Sarsia* proved that the only respect in which luminous stimulation differs from other modes of stimulation consists in its being exclusively a stimulation of ganglionic matter, we have evidence, in the case of *Tiaropsis*, of an enormous difference

* In all the *naked*-eyed division of *Medusæ*, to which *Sarsia* belongs, total paralysis of the bell can only be obtained by removing the *entire margin*; but in all the covered-eyed division, to which *Aurelia* belongs, paralysis of the bell ensues on removing the marginal *bodies* alone.

between the rapidity of response to stimuli by the contractile and by the ganglionic tissues respectively. The next question, therefore, is as to whether the enormous length of time occupied by the process of stimulation in the ganglia is due to any necessity on the part of the latter to accumulate the stimulating influence of light prior to originating a discharge, or to an immensely lengthened period of latent stimulation manifested by the ganglia under the influence of light.* To answer this question, I first allowed a continuous flood of light to fall on the medusid, and then noted the time at which the responsive spasm first began. This time, as already stated, was slightly more than one second. I next threw in single flashes of light of measured duration, and found that, unless the flash was of slightly more than one second's duration, no response was given. That is to say, the minimal duration of a flash required to produce a responsive spasm was just the same as the time during which a continuous flood of light required to operate in order to produce a similar spasm. From this, therefore, I conclude that the enormously long period of latent excitation in the case of luminous stimuli is not, properly speaking, a period of latent excitation at all; but that it represents the time during which a certain summation of stimulating influence is taking place in the ganglia, which requires somewhat more than a second to accumulate, and which then causes the ganglia to originate an abnormally powerful discharge. So that in the action of light upon the ganglionic matter of this medusid we have some analogy to its action on certain chemical compounds in this respect—that, just as in the case of those compounds which light is able to split up, a more or less lengthened exposure to its influence is necessary in order to admit of the summating influence of its vibrations on the molecules; so in the case of this ganglionic material, the decomposition which is effected in it by light, and which terminates in an explo-

* The period of latent stimulation merely means the time after the occurrence of an excitation during which a series of physiological processes are taking place which terminate in a contraction; so that, whether the excitation is of a strong or of a weak intensity, the period of latent stimulation is not much affected. The above question, therefore, was simply this: Does the prolonged delay on the part of these ganglia, in responding to light, represent the time during which the series of physiological processes are taking place in response to an adequate stimulus, or does it represent the time during which light requires to act before it becomes an adequate stimulus?

sion of nervous energy, can only be effected by a prolonged exposure of the unstable material to the summating influence of the luminous vibrations. Probably, therefore, we have here the most rudimentary type of a visual organ that is possible; for it is evident that, if the ganglionic matter were a very little more stable than it is, it would either altogether fail to be thrown down by the luminous vibrations, or would occupy so long a time in the process that the visual sense would be of no use to its possessor. How great is the contrast between the excitability of such a sense-organ and that of a fully evolved eye, which is able to effect the needful molecular changes in response to a flash as instantaneous as that of lightning!

Before leaving the case of luminous stimulation, I may observe that some of the *Medusæ* appear to be very fond of light. For, on placing a number of *Sarsiæ* in a large bell-jar in a dark room, and then throwing a beam of light through a part of the water in the bell-jar, the *Medusæ* all crowded into the path of the beam, and dashed themselves against the glass nearest to the light, very much as moths might do under the influence of similar stimulation. On moving the lamp round the jar, a cluster of *Medusæ* always followed it. This latter experiment is important, because it proves that the marginal ganglia are so far co-ordinated in their action that they can steer the animal in any particular direction.

Staurophora laciniata is a large species of naked-eyed medusa, which responds to stimulation in two very different ways, according as the stimulation is applied to the nervo-muscular sheet, or to the marginal ganglia. For, if the stimulation is applied to the nervo-muscular sheet, the response is an ordinary locomotor contraction; whereas, if the stimulation is applied to the marginal ganglia, the response is a tonic spasm of the same kind as that already alluded to in the case of *Tiaropsis polydiademata*. Now, it is a remarkable fact that into whatever form the bell of this medusa is cut—say, for instance, into the form of a long ribbon—whenever a locomotor contraction is started by stimulating any part of the general nervo-muscular sheet, it will pass all through that sheet, from end to end of the ribbon, in the form of an ordinary or gentle contractile wave. On the other hand, whenever a *spasmodic* contraction is started in the nervo-muscular sheet by stimulating any of the marginal ganglia, it will pass all through

that sheet, from end to end of the ribbon, in the form of a spasmodic or violent contractile wave. Hence the muscular fibres of the medusa are capable of liberating this energy in either of two very different ways; and whenever some of them liberate their energy in one of these two ways, they determine that all the other fibres in the nervo-muscular sheet shall do the same. So that we may adopt a far-fetched but convenient simile, and liken the muscular fibres in this medusa to the fibres in a mass of gun-cotton. For, in a mass of gun-cotton the fibres are likewise able to liberate their energy in either of two very different ways—viz., either by burning in quiet flame when they are simply ignited, or by exploding in a violent manner when they are detonated, as by a percussion-cap. And both in the case of the muscle-fibres of *Staurophora* and the cotton-fibres of gun-cotton, whenever any one of the whole number is made by appropriate stimulation (i. e., muscular stimulation or ignition) to liberate its energy in a quiet manner, then all the other fibres in the mass do the same; whereas, if any one of the whole number is made by another appropriate stimulation (i. e., ganglionic stimulation or detonation) to liberate its energy in a violent manner, then all the other fibres in the mass do the same. Now, why the ganglia of this medusa should thus act as detonators to the muscular fibres, and why, if they do, the muscular fibres should be capable of two such different kinds of response—these are questions quite novel in physiology, and as such, I will not endeavor to answer them.

Poison.—As my space is now very nearly exhausted, I will conclude this article by very briefly stating the general results of a large number of observations concerning the action of various nerve-poisons on the *Medusæ*. It is easy to see that this is an important branch of the inquiry on which I am engaged; for in the nerve-poisons we have, as it were, so many tests whereby to ascertain whether nerve-tissue, where it first appears upon the scene of life, is of the same essential character, as to its various functions, as is the nerve-tissue of higher animals.

Chloroform, ether, morphia, etc., all exert their anæsthesiating influence on the *Medusæ* quite as decidedly as they do on the higher animals. Soon after a few drops of the anæsthetic have been added to the water in which the *Medusæ* are contained, the

swimming motions of the latter become progressively slower and feebler, until in a minute or two they cease altogether, the animals remaining at the bottom of the water, apparently quite dead. No form or degree of stimulation will now elicit the slightest response; and this fact, it must be remembered, is quite as remarkable in the case of the *Medusæ* as in that of any other animal. Recovery in normal sea-water is exceedingly rapid, especially in the case of chloroform and ether.

The effects of strychnia may be best observed on a species called *Cyanæa capillata*, from the fact that, in water kept at a constant temperature, the ordinary swimming motions of this animal are as regular and sustained as the beating of a heart. But soon after the water has been poisoned with strychnia, unmistakable signs of irregularity in the swimming motions begin to show themselves. Gradually these signs of irregularity become more and more pronounced, until at last they develop into well-marked convulsions. The convulsions show themselves in the form of extreme deviations from the natural rhythm of this animal's motion. Instead of the heart-like regularity with which systole and diastole follow one another in the unpoisoned animal, we may now observe prolonged periods of violent contraction, amounting in fact to tonic spasm; and even when this spasm is momentarily relieved, the relaxation has no time to assert itself properly before another spasm supervenes. Moreover, these convulsions are very plainly of a *paroxysmal* nature; for after they have lasted from five to ten minutes, a short period of absolute repose comes on, during which the jelly-fish expands to its full dimensions, falls to the bottom of the water in which it is contained, and looks in every way like a dead animal. Very soon, however, another paroxyism sets in, and so on—prolonged periods of convulsion alternating with shorter periods of repose for several hours, until finally death puts an end to all these symptoms so characteristic of strychnine-poisoning in the higher animals.

Similarly, without going into tedious details, I may say in general terms that I have tried caffein, nitrite of amyl, nicotin, veratrium, digitalin, atropin, curare, cyanide of potassium, alcohol, as well as other poisons; and almost without any exception I find them to produce the same effects on the *Medusæ* as they severally produce on the higher animals. The case of alcohol is particularly interest-

ing, not only because an intoxicated jelly-fish is a ludicrous object to observe, but also because the experiments with alcohol show how precisely the specific gravity of the *Medusæ* is adjusted to that of the sea-water. For if, after a jelly-fish has become tolerably well drunk by immersion in a mixture of alcohol-and-water, it is transferred to normal sea-water, the exceedingly small amount of alcohol which it has imbibed is sufficient to make the animal remain permanently floating at the surface of the water until it again gets rid of the alcohol by osmosis.

As my space is now at an end, I must postpone for the present my account of a number of other experiments which, in point of interest, though not in point of systematic arrangement, have a better claim to statement than some of those which I have now detailed. It is impossible, however, in one article to treat of all the new facts which have been yielded by this research; so that by making the present article dovetail with the one which was previously published in *Nature*, and also with future articles on the same subject, I shall hope eventually to lay all the results before the general public.—*Fortnightly Review, in Popular Science Monthly.*

FUNDAMENTAL PRINCIPLES OF THE POSITIVE SYSTEM OF REGULATING TEETH

BY J. N. FARRAR, M. D., D. D. S.

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Mechanical appliances now used for correcting irregular teeth are constructed upon two principles, known as the Probable and Positive Systems, so called because one is sure in its action, while the other, owing to the nature of the mechanical principles involved, though probable, is more or less uncertain. These two systems are not only based upon mechanical principles peculiar to each, but have also important individual bearings in regard to physiological law.

The Probable System has for its basis the use of apparatus so constructed and operated by springs and elastic rubber, that a con-

stant and continued force is maintained, the management of which is not only generally beyond the control of the patient, but as it is exceedingly difficult, if possible, to harmonize its action with physiological principles underlying the operation of moving teeth, it is apt to lead to inflammation, pain and exhaustion.

The Positive System consists in the use of apparatus constructed on positive principles of mechanical action in such manner as to act intermittingly, permitting definitely, at will, the application of any degree of force desired, and is not only generally under the control of the patient, but can be operated perfectly in harmony with the principles of physiological law, thus obviating inflammation, pain and exhaustion.

This intermittent principle of action may be proximately attained by the use of the old and well-known wooden wedge, a peg set in a plate, an "inclined plane," or metal occasionally bent; but better still, and more scientifically, by means of an instrument which has been in limited use by the profession for such purposes for many years, *the screw*, because more positive and exact motions can thereby be secured.

This classification of systems grew out of "an inquiry into physiological and pathological changes in animal tissues during the process of regulating teeth," involving a long series of original experiments leading to the discovery of the importance of conducting such operations in accordance with the principles of physiological laws, and to the knowledge of what seemed to me to be the best method of conducting them.*

This process of movement of teeth in the jaw is not necessarily "a pathological one." While the movement of a tooth by artificial means, involving pain, inflammation and exhaustion is clearly indicative of the presence of a pathological condition of the tissues, the unconscious natural movement of teeth caused by improper articulation in overcrowded arches, accompanied with *no* pain or inflammation, is equally clear proof that the tissue changes have been carried on under physiological conditions.

* The result of these experiments was made known to several professional gentlemen in 1873, in a paper which, in February, 1874, was used as a thesis at graduation at Jefferson Medical College, read before the Brooklyn Dental Society, April 12th, 1875, published in the *Dental Cosmos*, Jan., 1876, and subsequently further elaborated in several papers in the same journal.

Absorption and re-formation of tissue (the changes necessary before and behind a migrating tooth), therefore, may take place under physiological as well as pathological conditions; the physiological process being painless, and the pathological generally being accompanied with pain and exhaustion. Experiments also prove that physiological changes may be induced by mechanical appliances as well as by natural causes, if properly used.

While perverted physiological action, indicated by pain, inflammation and exhaustion, is generally the result of such continued force as is practicable by art, and even by too great a degree intermittently applied, this condition may be avoided by the application of intermittent force of a proper and definite degree, alternated with proper intervals of rest—a principle which, in some respects, is analogous to the law of "labor and rest" in general life.

Referring those who are curious to know the minutiæ of these experiments to the above-mentioned paper, I will state that the basal principles of harmony between mechanical and physiological laws underlying the Positive System of treatment may be summed up in brief as follows:

A continued force, mechanically applied, with no intervals of rest, or even intermittent forces of too great degree, or too frequently applied, will tend to overstep the boundaries of physiological action and lead to a pathological condition accompanied with pain.

THE LAW.

Animal tissues may be made to become painlessly absorbed at will by mechanical pressure of a definite degree (suited to the tissue acted upon), if made in harmony with tissue changes while in a physiological condition, attained by the force of being periodically applied, and maintained when once made, and intermitted by proper intervals of rest, which may be accomplished, for illustration, by the use of the screw; thus enabling the tissue changes to be confined within physiological action.

The dividing line between physiological and pathological changes in the tissue of the jaw is found to lie within a movement of the teeth acted upon, allowing a variation, which will cover all cases, not exceeding one two-hundred-and-fortieth to one one-hundred-and sixtieth of an inch, and made about every twelfth hour; the exact degree of which can be best determined by the patient.

FACIAL NEURALGIA.

(*Read before the Linton District Medical Society.*)

BY DR. W. W. BIRKHEAD, LOUISIANA, MO.

Neuralgia of the face or 5th pair of nerves. I will first consider the opthalmic division. This branch of the 5th pair of nerves is distributed to the side of the nose, eyelids, lachrymal gland, globe of the eye, conjunctiva, forehead and scalp. There are particular spots in which neuralgic pains are always more severe than in others. These are points where the nerves pass through a foramen in the bone or penetrates a fascia. Some of those of this division are the supra orbital foramen or notch, the upper eyelid, the course of the nasal branch as it passes through the skin at the line of union of the nasal bones, another is the eyeball and at the angle of the orbit. Superior maxillary division: This branch is distributed to the teeth, lower eyelid, side of the nose, upper lip, lining membrane of the nose and mouth, and to the cheek and temple; it also unites freely with the ophthalmic division and is in intimate relation with the spheno palatine ganglion. The painful points of this nerve are as it emerges from the infra-orbital foramen, side of the nose, upper lip, teeth and palate. Neuralgia of this division is paroxysmal, and may, like that of the ophthalmic, be periodical in its attacks.

Inferior maxillary division: This nerve is distributed to the cheek, tongue, teeth of the lower jaw, and to the submaxillary gland. Its painful points are the temporal branch just in front of the ear, the mental foramen where the nerve emerges from the dental canal, and the teeth. Hammond says that facial neuralgia is rarely met with in young persons, but common in adults. I believe that the experience and observation of all of us will establish this fact: that it is more apt to attack females than males, and that it is of an hereditary diathesis. The chief causes of facial neuralgia in this country are malaria and the breaking down of tooth structure; among the minor causes I will mention excitement, hard study, exposure to cold, loss of blood, in cases of child-birth or prolonged lactation and cessation of the menses.

I have mentioned the decay and diseases of the teeth as one of the chief causes of neuralgia of the face, which I will attempt to

prove by my own experience and the experience and observation of others. Dr. Spalding, of St. Louis, says: "That a very large proportion of the cases of facial neuralgia located in the dental branches is due to complete or approximate exposure of the dental pulp occasioned by decay." The exposure of the pulp to external irritants in the form of food, cold air and mucus, excites local inflammation of that body, producing neuralgia in other parts of the face by reflex action. Kershaw says, in his treatise on facial neuralgia, that a number of cases of cervico-brachial neuralgia have been traced to diseases of the teeth, and naturally the removal of these causes has at once relieved the patient. Anstie also calls attention to this matter in the following words: "There is a special cause of cervico brachial neuralgia which is of more importance than, till lately, has been recognized, namely, reflex irritation from diseased teeth. James Salter, in a very able paper for 1867, says, that he has been surprised by the number of cases of reflex affections, both paralytic and neuralgic, of the cervico brachial nerves, produced by diseased teeth. There are a number of diseased conditions of teeth, outside of decay, that produce neuralgia: such as difficult eruption of the wisdom teeth, secondary dentine in the pulp cavity, decomposition of a dead pulp in a tooth, alveolar periostitis, exposure of sensitive dentine, especially in the months of pregnant women. Tomes says that in cases of neuralgia due to disease of the teeth, from the absence of local pain, frequently the cause is unsuspected. I have cured a great many cases of neuralgia of the temporal region, face and eye, by the removal of a diseased tooth. One very obstinate case, I remember, of neuralgia of the side of the face, in the hands of a physician friend of mine, I cured by removing the root of a central incisor, sticking from the point of which was a splinter of wood that kept up an irritation of the dental nerves. I cured another case of neuralgia of the ear and eye, within three or four days, by treating a tooth and removing some salivary calculi that had accumulated on the teeth, and using the battery. This patient my friend Buchanan had been treating for two years. Now, gentlemen, if you will allow me I will stop to consider some of the membranes of the teeth so as to ascertain some of the causes of facial neuralgia, which, I think, will be new to most of you: The teeth are composed of five different kinds of structure: the enamel, dentine, pulp, cementum and peridentum.

The enamel may be considered non-vital. The other four tissues, being largely composed of animal matter, are vital, and therefore subject to such abnormal conditions as are characterized by pain.

There is yet a question in the minds of anatomists whether there are two membranes within the alveolus or only one. One covering the root of the tooth, another lining the walls of the alveolus, or whether there be but one membrane serving a double functional purpose. There is also a difference of opinion with regard to the identity of this dental membrane; whether it is continuous with the periosteum of the maxillary bone, or the continued membrane of the pulp cavity and nerve canal. I am of the opinion that there are two membranes. First, the peridentium which holds vital relation to the pulp, secondly, the alveolar periosteum which is identical with the periosteum of the bone. Now after having made mention of the membranes of the teeth, I will pass on to the consideration of the conditions that they drift into, thereby producing still more obscure causes of neuralgia. It is not my purpose to enumerate the various diseases of the dental organs nor to point you to the various pathological conditions and structural changes of the vital tissues when diseased, for so doing would occupy too much time. I only desire to call attention to some of the causes of pain not commonly noted, which need be understood in determining treatment for a large class of cases that come into your hands. The solid material of the dentine being tubular in its structure, with its tubules pointing outwardly towards the surface of the enamel and opening inwardly upon the pulp and its surrounding peridentium, it will readily be seen that decay upon the grinding surface of a tooth will open the mouths of the dentinal tubuli for the action of the fluids of the mouth upon the highly vascular membranes of the pulp producing irritation and inflammation, the pressure of which is so great as to paralyze the action of the nerve at that point, causing the pain to roam over the side of the face not settling on any particular point but touching all. I can best illustrate these causes by giving you two or three cases in practice. I was called in to see a lady, twenty-five years old; I found her in a febrile, nervous, exhausted and almost frantic state, in bed with facial neuralgia. I examined her teeth closely, thinking as all medical aid had failed to relieve her, that the cause must originate in a tooth. I found a decay, but on probing I found it

without sensation. Her face at the base of the jaw was somewhat swollen, and within her mouth the loose integument joining the cheek and gums was puffed. She did not yield when the tooth was pressed. I tried cold water, thinking that if it was acute inflammation of the pulp, cold water would cause pain, or if congestion, that warm water would produce pain, but both failed. This helped me to a correct diagnosis of the case which I pronounced to be the force of confined gas, generated in the decomposition of the pulp, and seeking escape by exosmosis, but as the dentinal tubuli were completely clogged, the gas only accumulated to increase the pain. I determined at once to liberate the confined gas, which I did by drilling through into the pulp chamber. The patient was instantly relieved. With the escape of the gas there was a slight discharge of purulent matter from the decomposed pulp. The next case was that of a lady thirty years of age. I was called early in the morning. I found with her a physician who had been at her bedside through the night, and found, in a minute's conversation with the doctor, that it was a case of neuralgia of the ear and eye, and learned that his treatment had failed to afford more than temporary relief, the pain returning with increased violence. I examined the mouth closely, found a decay around an amalgam filling in one of the molar teeth but no exposure of the pulp. I was soon satisfied that the dentinal tubuli were nearly or wholly closed. I determined to make an entrance into the pulp chamber. I did it with a small drill; the relief to the patient was beyond her ability to express. The next and last case to which I will refer is rather an unusual one. It is a case of facial neuralgia of long standing. The patient, a lady of thirty-two years. On examination I found the side on which the pain was located, considerably enlarged, but no inflammation, no decayed teeth and no tenderness of the teeth on percussion. I finally made up my mind it was a case of exostosis of one of the molar teeth and this it was that gave rise to the neuralgia and enlargement. I removed the tooth and found it to be as finely a developed case of exostosis as I have ever examined I will pass the specimen around for your examination. I will just state that the case did not require further treatment. I could mention innumerable cases of neuralgia of the 5th pair of nerves due to diseased teeth, but I have quite likely already occupied too much of your time. I thank you most heartily for your attention.—*Linton Dis. Medical Journal.*

THE OLD PHRENOLOGY AND THE NEW.

BY DR. ANDREW WILSON.

There has ever lain a strange fascination, for culture and ignorance alike, in the attempt to diagnose the intellect and character of man from the outward manifestations of his face and skull.

Our present study concerns the deeper but not less interesting problem of the indexing of mind, and of the relations of brain-conformation and brain structure to character and disposition.

If the old phrenology, or the science of brain-pans, be regarded as practically obsolete among physiologists and scientific men at large, what hopes of successfully estimating the "coinage of the brain" may the new phrenology be said to hold out? To this interesting question, then, let us ask the reader's attention for a brief period. * * * * * *

The professions of phrenology are not by any means so correctly appreciated as might be thought, considering how well known is the name of the science, and how popular were its tenets within, comparatively speaking, a few years back.

How does the phrenological professor succeed very fairly in reading character? may be asked at the outset by readers who have had those parts of their disposition best known to themselves delineated with accuracy by the oracle. The reply is clear. Not through manipulating those mysterious "bumps," nor through any occult knowledge of the brains of his votaries, but simply from a shrewd talent for scanning the personal appearance and physiognomy of his clients, and by the dexterous suggestion of queries bearing on those traits of character which the features and manner reveal. Your successful phrenologist is in truth a shrewd physiognomist. His guide to character is in reality the face, not the brain-pan

One of the most convincing illustrations that even a practical knowledge of brain-structure is not necessary for the successful delineation of such superficial traits of character as can alone be determined by the casual observer, may be found in the fact that very few "professors" of phrenology have ever studied the brain, while a large proportion may never have seen an actual brain. A notable

example of a successful practice of phrenology being carried on independently of any knowledge whatever of the brain, is known to the writer, in the case of a worthy police-sergeant, who attained tolerable accuracy in the art of reading "the mind's construction," but who had never even seen a brain, and who had not the faintest possible idea of the appearance of that organ. Unless, therefore, one may logically maintain that total ignorance of the brain pan is compatible with an accurate understanding of its contents and mysteries, the successful practice of phrenology must be shown to depend on other data and other circumstances than are supplied by anatomy and physiology—these sciences admittedly supplying the foundation of all that is or can be known regarding the brain, its conformation, structure and functions. Empirical science—science falsely so called—will not hesitate to assert its ability to accurately solve the deepest problems of character and mind. But the more modest spirit of the true scientist will hesitate before crediting itself with any such ability, or even before giving assent to such general rules of character as are exemplified by the saying, "Big head and little wit"; or by that of the worthy Fuller, who, in his "Holy and Profane State," remarks that "often the cock-loft is empty in those whom Nature hath built many stories high."

The fundamental doctrine of the old phrenology is well known to most of us. Its great doctrine is pictorially illustrated in the china heads of the opticians' windows, and may be summed up in the statement that different parts or portions of the brain are the organs of different faculties of mind. If phrenology be credited with materializing mind in the grossest possible fashion, its votaries have themselves and their science to thank for the aspersion. If it be maintained that feelings of *destructiveness* reside above the ear, then must we localize the desire to kill or destroy in so much brain-substance as lies included in the "bump" in question. When vainglory besets us, we must hold, if we are phrenologists, that there is a molecular stirrage and activity of brain-particles beneath a certain bump of "self-esteem" situated above and in front of the ear; while feelings of veneration, of hope, or of wonder, are each to be regarded as causing a defined play of action in particular bumps and special quarters of the brain Were the deductions of phrenology true, or were its claims to be regarded as a science

founded on definite grounds, mind could no longer be regarded as a mystery, since it would be within the power of the phrenologist to assert that, when swayed by emotions of one kind or other, he could declare which part of the brain was being affected. This declaration logically follows upon that which maintains the localization of faculties in different parts of the brain; but it is a conclusion at the same time from which physiology simply retires in outspoken disdain, as presenting us with an empirical explanation of mysteries to which the furthest science has as yet failed to attain.

That we may duly understand, not merely the falsity of the old phrenology, but the bearings of the new aspect of brain-science as revealed by modern physiology, we must briefly glance at the general conformation of the brain. The organ of mind, contained within the skull, consists of the greater brain or *cerebrum*, and the lesser brain or *cerebellum*. The latter portion is situated at the back of the head, and forms the hinder part of the brain; the spinal cord, which, as every one knows, runs through the spine, being merely a continuation of the main axis of the nervous centers of which the brain is the chief. When the surface of the human brain is inspected, it is seen to present a very unequal appearance, due to the fact that its substance is thrown into a large number of folds or *convolutions*, as they are technically named by the anatomist. The brain, or cerebrum, is in reality a double organ, formed of two similar halves or *hemispheres*, which are separated by a deep central fissure, but which are also connected together below by a broad band of nervous matter known as the *corpus callosum*. It is this latter band which brings the halves of the brain into relation with one another, and which thus serves to produce identity and correlation of action between its various parts.

To the nature of the convolutions our especial attention must be directed. The brain-substance consists of gray and white nervous matter. The gray matter forms the outermost layer of the brain-substance, and incloses the white; the opposite arrangement being seen, curiously enough, in the spinal cord. Now, one evident purpose of the convolutions of the brain is to largely increase the amount of its gray matter relatively to the space in which the organ of mind is contained; while the perfect nutrition of the brain is also thus provided for through its convoluted structure, permitting a fuller distribution of the minute blood vessels which supply

the brain with the vital fluid. It is a very noteworthy fact that the structure of the gray matter differs materially from that of the white. In the gray matter nerve-cells are found in addition to nervous fibers, the former originating nervous force, while the latter are simply capable of conveying this subtile force. Thus it may be said that it is in the gray matter that thought is chiefly evolved, and from this layer that purposive actions spring. The white matter, on the other hand, merely conveys nerve-force and nervous impressions; and is thus physiologically inferior in its nature to the gray substance. The observations of Gratiolet, Marshall, and Wagner seem to leave no room for doubt that the convolutions of the brain increase with culture, and are therefore more numerous and deeper in civilized than in savage races of men. It is curious, however, to observe that certain groups of quadrupeds are normally "smooth-brained," and possess few or no convolutions. Such are rats, mice, and the rodents or "gnawing" animals at large, and it can hardly be maintained that in those animals intelligence is normally low or instinct primitive; although, indeed, the just comparison of human with lower instincts must be founded on a broader basis than is presented by this single anatomical fact.

A final observation concerning the anatomy of the brain relates to its size and weight as connected with the intelligence. The phrenological doctrine of the disposition of the faculties must be held to include the idea that the larger the brain the better specialized should be the mental qualities of the individual; the greater the amount of brain-substance forming the good and bad qualities and regions of the phrenologists, the more active should be the mental organization. Now, it is a patent fact that this rule tells strongly against the phrenologist's assumption. True, various great men have had large brains; but cases of great men possessing small brains are equally common, as also are instances where insanity and idiocy were associated with brains of large size. The normal average human male brain weighs from 49 to 50 ounces; man's brain being ten per cent. heavier than that of woman. Cuvier's brain weighed 64½ ounces; that of Dr. Abercrombie 63 ounces; that of Spurzheim, of phrenological fame, 55 ounces; Professor Goodsir's brain attained a weight of 57½ ounces; Sir J. Y. Simpson's weighed 54 ounces; that of Agassiz 53.4 ounces, and that of Dr. Chalmers 53 ounces. As instances of high brain-

weights, without corresponding intellectual endowment, may be mentioned four brains weighed by Peacock, the weights of which varied from 67.5 to 61 ounces. Several insane persons have had brains of 64½ ounces, 62 ounces, 61 ounces, and 60 ounces, as related by Bucknill, Thurnam and others. With respect to the brain-weights of the fair sex, anatomical authority asserts that in woman with brains weighing 55.25 ounces and 50 ounces, no marked intellectual features were noted. Below 30 ounces, the human brain becomes idiotic in character, so that there appears to exist a minimum weight, below which rational mental action is unknown. The anatomist's conclusions regarding brain capacity and mental endowments are, therefore, plain. He maintains that the size and weight of the organ do not of themselves afford any reliable grounds for an estimate of the mental endowments, while his researches also prove that a large brain and high intellectual powers are not necessarily or invariably associated together.

The foregoing details will be found to assist us in our criticism of the pretensions of the old phrenology as a basis for estimating "the mind's construction" and the mental habits of man. Primarily, let us inquire if development—that great criterion of the nature of living structure—lends any countenance to the idea that the brain is a collection of organs such as the phrenologist asserts it to be. The brain of man, like that of all other backboned animals, appears to begin its history in a certain delicate streak or furrow which is developed on the surface of the matter of the germ. Within this furrow the brain and spinal cord are at first represented by an elongated strip of nervous matter, which strip, as the furrow closes to form a tube, also becomes tubular, and incloses within it, as the hollow of the tube, the little canal which persists in the center of the spinal cord. The front part of this nervous tube, which soon exhibits a division into gray and white matter, now begins to expand so as to form three swellings named *vesicles*. From these vesicles the brain and its parts are formed. The foremost swelling soon produces the parts known as the optic lobes, and also the structures which are destined to form the hemispheres or halves of the brain itself. The middle swelling contributes to the formation of certain important structures of the brain; and finally the cerebellum or lesser brain, along with the upper part of the spinal cord and other structures, appear as the result of the full development of the hinder or third swelling. Nor

must we neglect to note that at first the human brain is completely smooth and destitute of convolutions, and only acquires its convoluted appearance toward the completion of development.

It is now an appropriate duty to inquire if the history of the brain's growth affords any countenance or support to the phrenological division of the organ into some thirty-five different organs and seats of faculties. The query is further a perfectly legitimate one. The phrenologist maintains the actuality of his deductions respecting the "organs" of mind, and it is only a fair and just expectation that, if the brain be a congeries of such organs, the anatomist should be able to see these parts as development has revealed them. The nature of the brain is asserted by the phrenologist to exist in its composition as a set of organs. That nature, argues the anatomist, if revealed at all, should present itself in its development, which alone can show us nature's true fashion of building a brain. What, therefore, is the result of the anatomist's study of the manner in which the brain is fashioned? The answer is found in the statement that there is not a trace of a single "organ" such as the phrenologist theoretically maintains is represented in the brain. There is no division into separate parts and portions, as the phrenologist's chart would lead the observer to suppose. The scalpel of the anatomist can nowhere discover in the full-grown brain an organ of veneration, or of hope, or of language, or of destructiveness, or of any other mental feature; nor can his microscope detect in nature's wondrous process of fashioning the brain any reason for the belief that the organ of mind is a collection of parts each devoted to the exercise of a special quality of mind. The arrangement which appears so clear on the phrenologist's bust is nowhere represented in the brain itself. And the organs of the phrenologist, in so far as their existence is concerned, may not inaptly be described in Butler's words as being

> Such as take lodgings in a head
> That's to be let unfurnished.

But if development gives no support to the phrenological assertion to the brain's division into organs of the mind, neither does anatomy, human and comparative, countenance its tenets as applied to the examination of the brain-pan itself. To select a very plain method of testing the deductions of phrenology, let an anatomical plate of the upper surface of the undisturbed brain be exhibited, and,

having settled the position of certain "organs" from a phrenological chart, let any one try to discover if the limits of any one organ can be discerned on the brain-surface. He will then clearly appreciate the hopeless nature of the task he has undertaken, and be ready to shrink from the attempt to resolve the complex convolutions before him into a square inch here of one faculty, or a square inch there of another. Moreover, one very important consideration will dawn upon the reflective mind which considers that the convolutions of the brain are not limited to the crown and sides of the head, but, on the contrary, extend over the entire surface of the cerebrum, and are developed on its base. No phrenologist has attempted, it is true, to get at the base of the brain by inspecting the palate; but it would be regarded as an absurd and unwarrantable statement to assert that the base of the brain has no functions, and that the mind of man is located only at the top and on the sides of the head. Yet the phrenologist is in the position of one making such an assertion, since his science takes no account of the base or internal parts of the brain—situations, forsooth, in which anatomy and the newer phrenology demonstrate the existence of very important sensory and other organs. The question of the relatively immense tracts of brain which lie without the utmost ken of phrenology, even on its own showing, is also illustrated by the observation that the bulging or hollowing of the skull at any point affords no criterion of the thickness of the gray matter of the brain, a layer which we have already seen to constitute the most important part of the brain-substance. This gray matter is seen to exist in tolerable uniformity over large tracts of brain-substance, and it is invariably in the hinder region of the brain that it attains its greatest complexity and development. The form of the skull is dependent on the amount and disposition of the white matter, and not on that of the gray; and the former, as we have seen, has but a minor influence or part in the mental constitution, since its function is merely that of conducting and not of originating thoughts and impressions. Since, then, phrenology lays so much stress on skull-conformation as a clue to brain-structure, it must be regarded as dealing rather with the results of the disposition of the white matter than with that of the gray—and this latter assumption of necessity involves a a second, namely, that phrenology has no status as a science of mind at all.

There is one consideration concerning the practical application of the phrenologist's assertions too important to be overlooked, namely, the difficulty of detecting or of mapping out on the living head the various "bumps" or organs of mind which appear to be so lucidly localized on the bust or chart. The observer, who might naturally think the determination of the "bumps" an easy matter, has but to try to reconcile with a phrenological chart, or with the brain-surface itself, the configuration of a friend's cranium, and he will then discover the impossibility of distinguishing where one faculty or organ ends and where another begins. How, for instance, can the exact limits of the four or five organs of mind, to be hereafter alluded to more specifically, which are supposed to exist in the line of the eyebrow, be determined? What is the criterion of excessive or inferior development here, and how may we know when one "encroaches" upon another to the exclusion or atrophy of the latter? The practical application of phrenology indeed constitutes one of its difficulties; and added to the difficulty or impossibility of accurately mapping out the boundaries of the phrenologist's organs, we must take into account the fact that we are expected to detail these organs through, in any case, a considerable thickness of scalp, which veils and occludes, as every anatomist knows, the intimate conformation of the skull-cap. At the most the phrenologist may distinguish regions; his exact examination of the living head *a la* phrenological chart or bust is an anatomical impossibility.

But the anatomist has also something of importance to say regarding the actual existence of certain of the "organs" of mind mapped out by the phrenologist. Leaning trustfully upon their empirical deductions, the phrenologists have frequently localized faculties and organs of mind upon bony surfaces separated from the brain by an intervening space of considerable kind. In so far as comparative anatomy is concerned, phrenology receives no assistance in its attempt to localize mind-functions in man. An elephant is admittedly a sagacious animal, with a brain worth studying; just as a cat or tiger presents us with a disposition in which if brain-science is applicable, as it should be, to lower forms of life exhibiting special traits of character, destructiveness should be well represented and typically illustrated. Alas for phrenology! the bump of destructiveness in the feline races resolves itself into a mass of jaw-muscles, and the elephant's brain is placed certainly not within

a foot or so of the most skillful of phrenological diggers. The "frontal sinuses" or great air-spaces in the forehead bones of the animal intervene between the front of the brain, the region *par excellence* of intellect according to phrenology, and the outside layer of the skull. So that an observer could no more accurately construct a phrenological chart of an elephant than he could diagnose the contents of a warehouse by scanning the exterior of the building.

Not merely, however, are the difficulties of phrenology limited to the lower animals. Suppose we make a cross-section of a human skull through either the right or left side of the forehead, about half an inch above the upper border of the orbit or eye cavity. We may then discover that man as well as the elephant possesses "frontal sinuses" or air-spaces in his forehead bone of considerable extent intervening between the exterior of the skull and the contained brain. Now, in such a section of the human skull, what phrenological "organs" shall we cut through? Certainly those of "individuality," "form," "size," and "color." In placing such organs across the eyebrows, the phrenologist might naturally be regarded as having proceeded on the assumption that he was mapping out on the exterior of the skull a certain part of the brain-surface. What shall be said of his procedure, however, when the reader learns that a section of the skull made as indicated through these organs shows that they—i. e., the "organs" as marked on the outside of the skull—overlie the hollow spaces or "frontal sinuses," and are actually separated from the brain by cavities of considerable extent, in some cases exceeding an inch? Such a demonstration truly speaks for itself, and no less so does the anatomist's discovery that the "organ" of phrenologists known as "form" actually reposes in anything but a noble position on the cavity of the nose; that the organ of "calculation" is a solid bony (*orbital*) process; and that the size of the organ of "language" really depends upon the want of forward projection of the eye depending on the special development of a bony process on which the organ of sight rests, and which in any case has nothing whatever to do with the brain. Of language more anon; but enough has been said to show that a connection with the brain is not an invariable or apparently necessary condition for the construction of a phrenological "organ" of the mind—the fact that the brain is the organ of mind notwithstanding.

But neither does the case for phrenology fare any better when it is tested by the results of the examination of crania belonging to persons whose family or personal history was well known, and whose characters, in respect of their thorough and stable formation, would therefore serve as a test of phrenological or any other system of mind-explanation. In the heyday of phrenological discussion, and in Edinburgh as the very focus and center of the arguments *pro* and *con.* the system of Gall and Spurzheim, a Mr. Stone, then President of the Royal Medical Society, read in 1829 a paper in which the results of a most laborious and conscientious series of observations on the crania of well known persons were detailed. These results, as will presently be shown, were fatal to any ideas which might have been entertained regarding the authentic nature of the data on which phrenological observations were founded. Fifty skulls were selected for measurement from the famous collection of Sir William Hamilton, fifty others being taken from that of Dr. Spurzheim himself. In the case of the skulls of fifteen murderers, whose crimes had been marked by unusual brutality and violence, and who might therefore be regarded as exemplifying cases in which the largeness of the "organ" of destructiveness might be lawfully postulated by a phrenologist, Mr. Stone demonstrated by careful measurement and comparison that each of the fifteen had the organ or surface of "destructiveness" *absolutely less* than the average of ordinary heads, while thirteen of these skulls possessed this organ *relatively less* when compared with the whole contents of the brain-pan. Nor was this all. Thirteen of these fifteen worthies possessed a larger organ of "benevolence" than the average, and their "conscientiousness" was also as a rule well developed. Their brains were not markedly deficient in front of the ear—the region of the intellectual faculties, according to the phrenologist—nor were they unusually developed behind the ear, where the animal faculties are supposed to reside.

No less instructive were the comparisons instituted between the faculties of Dr. David Gregory, once Professor of Mathematics in the University of Edinburgh, and Savilian, Professor of Astronomy at Oxford, a friend and contemporary of Sir Isaac Newton. Professor Gregory's character was well known as that of an amiable, accomplished, intellectual man. In such a case the moral faculties would be expected to present high development, while the animal aculties and baser qualities would naturally be regarded as being

but poorly represented. Mr. Stone's measurements, duly verified by independent observers, elicited the awkward fact that Dr. Gregory should, according to the phrenological interpretation of his cranium, have ranked in the criminal category, since his organ of "destructiveness" was found to exceed in size that of every murderer in the collection under discussion! In proportion to the general size and form of the brain, Dr. Gregory's "destructiveness" was larger than that of the notorious Burke, who was executed at Edinburgh for the cold-blooded murder of men, women, and children, whose bodies, along with his coadjutor Hare, he sold for purposes of anatomical inspection. Not to enumerate in detail the startling results which the fair and unbiased examination of Dr. Gregory's cranium afforded, it may simply be mentioned that the Professor's "combativeness" was larger than that of any of the debased villains, with whom his faculties were compared. Burke equaled him in "benevolence"; in "secretiveness" he excelled the noteworthy fifteen; his "acquisitiveness" exceeded that of Haggart and other noted thieves; his "causality"—the power of reasoning closely, and of tracing the relations between cause and effect, a faculty which as a mathematician he should have possessed largely developed—was less than that of the criminals; and his intellectual faculties at large were of less capacity than theirs, as his animal faculties were present in greater force.

No further illustration is required of the fact that, tested under exceptionally favorable circumstances, the deductions of phrenology are absolutely incorrect, not to say absurd. Nor is the case of the phrenologists bettered by their exercise of apologetics in face of the hard logic of the above and similar facts. Thurtell, with very large "benevolence" and with well-developed "veneration," yet committed an atrocious murder, and this without a special development of "destructiveness." "Nothing can justify the murder," saidthe phrenologists, but Thurtell imagined that he would "do a service to society by killing his friend and hence his crime." Thus benevolence, by the exercise of phrenological apologetics, becomes an excuse for and an active cause of murder. Dr. Gregory's "destructiveness," said the phrenologists, was held in check by some other qualities—by which qualities it would be hard to say, seeing that, tested by phrenology, his whole mental and moral organization was below that of the average murderer. So that we are to believe,

in short, that "destructiveness," and the other base qualities of the Professor, being absolutely useless, must have been intended simply for show and not for use. Things, on this reasoning, truly are not what they seem; and phrenology thuswise cuts away from under itself its fundamental propositions, that its "organs" are the seats of faculties, and that their activity is proportional to their size.

But to proceed further would be to slay the slain. This much indeed we have said of the phrenology which still lingers in our midst, by way of contrast with the newer order of brain-interpretation which the advance of physiology has caused to arise among us. In the early days in which the battle of phrenology was fought and won as against the science of brain-pans, physiological experimentation upon the brain was an unknown and unworked source of information. In due time came Flourens, Magendie, Fritsch, Hitzig and Ferrier, with their exact methods and results, enlarging the conceptions of the brain and its powers, and throwing here and there a ray of light upon the dark places and hidden corners in the domain of the physiology of mind. Hence our new "phrenology" —for the word itself is perfectly explicit as denoting a science of mind or brain—is gradually being built up from sure data and accurate experimentation, the results arrived at by one worker being tested by a host of fellow-experimenters ere his inferences become facts, and before they are allowed to form part and parcel of the scientific edifice. Let us briefly see what are the more prominent facts concerning the brain and its functions which recent science has elucidated.

No part of the brain has perhaps presented problems of such interesting character as the *cerebellum* or lesser brain, which, as already remarked, exists at the hinder and lower part of the head, and which moreover presents us with a structure differing from that of the cerebrum itself. Phrenologists located in the cerebellum the purely animal faculties. "A man," as we remember hearing a phrenological lecturer say, "with a head bulging out behind, is going backward in the world;" and there was indeed, as we shall see,, a modicum of truth (although he knew and understood it not) in the lecturer's remark, since without the cerebellum we could in reality proceed neither forward nor backward. We now know that the old phrenology of the cerebellum is utterly wrong and un

founded. The new phrenology has shown us that in cases of diseased animal appetites, which in our lunatic asylums are but too frequently represented, the cerebellum is not found to be affected—a result explained by the fact that the appetites referred to are indeed as much part of our "mental" constitution as is the exercise of benevolence or of any other mental faculty. Furthermore, the new phrenology supplies positive evidence as to the true functions of the cerebellum. When it is removed from a pigeon, for instance, the animal retains its faculties, it will feed, it can see and hear, but is utterly unable to maintain its equilibrium. If thrown into the air, it flaps its wings in an erratic and aimless fashion. In one word, it can not "co-ordinate" its movements, that is, it can not so adjust the motions of one set of muscles as to bring them into purposive harmony with another set or series. The cerebellum thus appears to be the great brain-centre whence are issued the commands and directions which guide the muscular actions and movements of our lives. Contrariwise, the true functions of the cerebellum are proved by experiments in which this part of the brain has been left intact while the cerebrum or true brain has been removed —an operation absolutely painless, as will presently be more particularly mentioned. A bird or higher animal in such a case will lose all power of volition; it will be deprived of sight, hearing and other senses; it will die of hunger unless fed; it will exhibit no desire to move; and will in short present a condition utterly opposed to that seen when the cerebellum is removed and the true brain left intact. But with its cerebellum present, and *minus* its true brain, the bird can perfectly "co-ordinate" its movements. It will fly straight if thrown into the air, it will walk circumspectly enough if pushed forward, and will exhibit in fact such perfect muscular control, despite its want of volition and intellect, that the functions of the cerebellum as a controller of movements are no longer matter of hypothesis, but have become stable physiological fact.

If, however, the old phrenology has been displaced from the cerebellum by the new, no less important is it to note that, regarding the functions of the true brain, modern research has been equally successful in deposing the old ideas of the "organs" and their attendant faculties as exhibited on the phrenological charts and busts. Experimentation on the brain of higher animals, *quoad* the brain itself, is absolutely painless—contrary to popular notions

and ideas. True, there are certain parts of the brain which are exceedingly delicate, and in which the point of a needle would inflict at once a fatal injury. But the brain-substance itself is utterly nonsensitive, as every hospital-surgeon can tell us. Persons may actually recover from serious injuries of the brain in which several ounces of brain-substance may have been lost, and recover with good effect, and in many cases without any perceptible alteration of their mental peculiarity. The most notorious case of this kind is known as "the American crow-bar case." A bar of iron accidentally shot off from a blast passed through the top of a young man's head at the left side of the forehead, having traversed the front part of the left hemisphere or side of the brain. The iron bar measured three feet in length, and weighed fourteen pounds. After the accident he felt no pain, and was able to walk without help in a few hours' time. The man made a good recovery, and for twelve years made a livelihood by exhibiting himself in the United States, his skull being now preserved in the museum of Harvard University. This patient undoubtedly lost a relatively large portion of his brain substance. At one fell swoop there must have been a considerable destruction of phrenological organs. Yet he suffered from no deprivation of intelligence; and few would dream of associating the drinking habits which finally beset him with his accident and with his loss of brains, or otherwise maintain that he was less rational before than after the accident. Thus the misfortunes of existence and the experimentation of the physiologist positively contradict the old phrenology, and assert that localization of function does exist, it is true, but that the "organs" of the phrenologist are mere theoretical nonentities, without a trace of substance to insure their stability or real nature.

What amount of localization, then, can be safely assumed to exist in the human brain as revealed by recent experimentation? It may be known to the generality of readers that the movements, acts, and probably ideas relating to one side of the body are regulated by the opposite side or hemisphere of the brain. Thus, convulsions affecting one side of the body were shown by Dr. Hughlings Jackson to be caused by disease of the opposite side, and the idea of the duality of the brain's action followed in a natural sequence on the observation of facts like the preceding. Thus, as a general rule, it may be affirmed that brain-disease itself, or the ideas

of natural existence, are so far localized that their perfect effects are only visible and appreciated when the same parts in both halves or hemispheres of the brain are affected. To illustrate what the new phrenology has to say regarding the localization of the brain-functions, let us inquire what is known regarding the exceedingly curious condition known as "aphasia." Persons affected with this lesion understand perfectly what is said to them, but they are absolutely speechless, and can not utter a single word. Now, it is a perfectly well-ascertained fact that aphasia is associated with disease of the front part of the *left* half or hemisphere of the brain – a part which may therefore be called the "speech-center." The curious fact must thus be emphasized that aphasia is invariably associated with disease of the left, and never with disease of the right side of the brain. To the brief explanation of this curious fact we shall presently return; but we may in conclusion remark certain facts now known respecting the localization of other functions. Professor Ferrier, of King's College, London, employing electricity as the only agent and means of stimulation to which the non-sensitive brain will respond, has succeeded in mapping out in the brains of higher animals the centers which govern many of the common movements of life, and which from reasonable analogy may be presumed to be represented in the human brain as well. As these acts are the practical outcome of ideas, the parts of the brain concerned in the production of definite ideas may thus be regarded as being in one sense mapped out and recognized; although it is hardly necessary to remark that the regions of Dr. Ferrier in no wise correspond to those of the old phrenology, while in many cases, indeed, they are utterly opposed to it. Thus the sense of touch is found to be localized in the inner surface of the hemispheres of the brain, and this fact alone tells against the phrenologist, to whom the mere brain-surface is the brain itself.

Thus the work of localizing movements and important centers of the senses has so far proceeded with success. There yet remains for observation the curious case of aphasia or speechlessness, and its location in a "speech-center" or "speech-organ" in the front of the left hemisphere of the brain. It is a noteworthy fact in brain-physiology, that when an animal has been rendered blind by the destruction of the sight-center of one side, blindness disappears and sight gradually returns, since the remaining and normal sight-center of the

opposite side assumes the functions of its neighbor. Complete blindness only ensues when both sight-centers are diseased. The same remark holds good of the movements of the mouth and tongue in speech, these being "bilateral," so that the center of these latter movements on one side may be destroyed without causing paralysis of the tongue, provided the center of the other side is uninjured. Movements of the hands and feet are, on the contrary, one-sided. Destruction of one center governing these latter movements insures complete cessation of the movements on the opposite side of the body. Now, in aphasia or speechlessness, we merely perceive the results of the destruction of the single speech-center—the left—which man normally possesses. Just as we use the right hand in preference to the left in prehension and in writing, and as the movements of this hand are regulated by the left side of the brain, so our faculty of articulation is also unilateral and single-handed, so to speak. The memory of sounds and words forms the basis of our speech—"the memory of words is only the memory of certain articulations"—and those parts of the brain which regulate articulation are also the memory-centers for speech or the result of articulation. Thus, when the speech-center is disorganized, not merely the power of articulation disappears, but also the memory of words But while the left side is that of the speech center, there is no reason, as Dr. Ferrier remarks, apart from heredity and education, why this should necessarily be so. "It is quite conceivable," says this author, "that a person who has become aphasic by reason of total and permanent destruction of the left speech-center may reacquire the faculty of speech by education of the right articulatory centers." We speak with the left side of our brains, in short, not because we are unable to do so with the right side, but simply because habit and the law of likeness together strengthen and perpetuate the custom of speaking with the left. But it may be also supposed that, as a left-handed person must regulate the movements of his arms chiefly by the right side of his brain, so there may exist subjects who naturally use the right instead of the left speech-center.

Whatever results may in future accrue to human knowledge from researches into the functions of the brain, no one may doubt the all-important nature of the knowledge which literally enables man to know himself, and to understand in some degree the mainsprings

of the actions which constitute his daily existence. The subject is also no less instructive in the sense in which it shows the displacement of erroneous ideas by new and higher thoughts founded on accurate observation of the facts of life; while in a very direct fashion such higher knowledge may affect suffering humanity, since an educated medical science, furnished with secure data regarding the causes of mental affections, may successfully "minister to minds diseased," and even in due time raze out the troubles which perplex many a weary soul.—*Gentleman's Magazine, condensed from Pop. Sci. Monthly.*

BOOK NOTICE.

DISEASES OF CHILDREN, a practical manual by EDWARD ELLIS, M. D. This is a reprint of a standard English work, and is the second volume of Wood's Library of Standard Medical Authors. The subjects treated of in this volume are Management and Diet, General Diseases, Congenital Affections, Fevers, Nervous Affections, Pulmonary and Intestinal Diseases and Therapeutical Hints, etc., etc. The book has a practical value scarcely equalled by any similar work extant, and should be in the hands of every practioner who proposes to keep himself informed relative to the most improved treatment of infantile diseases.

Notices of other books received will appear in the next number.

EDITORIAL.

This number contains an article of unusual length. Longer, we fear, than will be acceptable to the majority of our readers. The importance of the subject to which the paper is devoted, together with the fact, that the interest in its perusal would be greatly marred by breaking it into parts, is our excuse for giving up so many pages to one topic. The article reveals the discovery of the existence of an organized system of nervous centres, and of radiating nerve fibres in a class of animals lower in the scale than has heretofore been demonstrated. The presence of a nervous system in this class of animals has long been inferred, but its existence has not been previously shown. That its discovery was effected by physiological rather than by microscopical aids, is another point of no inconsiderable moment. A careful study of the article will amply repay the reader.

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THE ORIGIN OF ANIMAL HEAT AND BRAIN FORCE.

BY J. F. SANBORN, D. D. S., M. D., TABOR, IOWA.

"The greatest study of mankind is man."

Man was created in the image of his Maker, in that he is a trinity, consisting of a body, a mind and a soul.

The corporeal and spiritual essence of man are united during life so that the body without life is as inert as is inorganic matter, so far as independent action is concerned; and is subject to chemical action—a separation of the structure into the elements of which it is composed.

So far as this argument is concerned, it does not make any difference whether man was primarily developed from a germinal bioplast so minute that it would require 64 billions to make a cubic inch in bulk; and, from that small beginning, was developed through the various grades of animal life, including the higher class of monkeys; or, whether he was created with such primal perfection of human form, as to be "very good" in the sight of the divine Creator.

The Scriptures teach us that God breathed into man the breath of life, and he became a living soul; the question, what constitute

the soul, in contradistinction to the living principle, is not the question now under consideration; but it is the physiological relationship between the vital changes incident to life, and the FORCE that rules and governs those changes; together with the source of that force, its relationship to vital phenomena, and such illustrations and applications of scientific principles, as shall throw at least some light on this abstruse subject.

At the beginning of the race, man was constituted with a body, mind and soul, the same as he has now, but with this difference: at first he was physically so well and perfectly balanced, that some of the old patriarchs lived almost a thousand years; while the present age of man is noted for mentality wherein he is weaker but wiser than at any period in the history of the race.

The age is yet to come when the soul shall have chief sway in governing the thoughts and actions of man, but when that time does come, it will be the long sought for "good time coming."

The present is the mental age of the race, when even the principles of science are scarcely embodied in our text-books, before they become obsolete, or are superseded by the products of that never-ending research, not only for the marvelous and the new, but also for the useful and the true which in no part of this research has resulted in greater advancement than in the study of physiology.

In fact, the greatest minds of the civilized world, have used the utmost strength of their mentality in solving the mysteries of vital action.

As fast as new ideas are advanced in this, in common with other branches of human investigation, other minds detect and sift out the fallacies connected therewith; and then the "true remainder" is used as a stepping-stone to more exalted and extended views of the subject under examination.

These stepping-stones are as necessary for the continuance of such acute research after truth, as the observatory with its powerful telescope is for the study of astronomy.

We propose to use such helps as come to our hand, and such original thoughts as a long and continued study of the subject shall suggest, and then cast the result into the common mass, and let the mill of many minds stamp in pieces the quartz-like difficulties, until the truth, like pure gold, shall be added to the great treasury of knowledge.

It requires a certain amount of force to raise a given weight to a definite height in a given time; this is known as a certain number of horse-powers. The raising of the masses in morals, or in education, is no exception to this rule; so that there is no real loss in well directed effort.

We may lose sight of it for a time, but like the correlation of forces, it is but changed to some other mode of action, but is not lost. Motion is changed to heat, or heat to motion, it is not lost; it is only changed in its form of manifestation.

All matter, whether organic or inorganic, animate or inanimate, is subject to the laws of force, which is that active principle inseparable from matter, which is supposed to induce its various changes. Force is the primary cause that produces, or arrests, motion. Chemical affinity, heat, light and electricity, are various forms of this manifestation of force, and are co-related and interchangable forms of force.

Chemical affinity is force by which dissimilar bodies tend to unite and form compounds differing in character from either of their constituents.

Heat is the manifestation of force which tends to move the particles of all bodies or to separate them from each other. Light is the physical agent which makes an impression on consciousness by which we are enabled to see it, or by its aid see other objects. The most comprehensive definition of electricity, is a polarized motion; and is manifested under the following different forms:

1st. Frictional or common electricity.
2d. Galvanic electricity, the result of chemical affinity.
3d. Thermotic electricity caused by heat.
4th. Electricity produced by evaporation and condensation.
5th. Atmospheric electricity, or that in the clouds.
6th. Magnetic electricity, as the helix.
7th and 8th. Positive and negative electricity, which consists of the currents that pass from the former to the latter.

Motion is a change of position in space.

The various manifestations of force are so related to each other that they are interchangeable.

Chemical affinity produces heat as in the burning of wood or coal. The oxygen of the air combines with the carbon of the wood and disintegrates it, reducing it to its original elements. The

gases originally derived from the air in the growth of the wood, are restored to the air in the form of smoke or gases, that which remains as ash was derived from the earth and is in condition to be restored to it; but the chemical affinity that caused this disintegration, is converted into heat, and also more or less of galvanic electricity, which is lost in the surrounding air. The consumption of wood in the furnace of a steam engine is but a change of chemical affinity into heat, the heat produces steam in the boiler, the steam causes motion, and the long train of loaded cars moves on to its place of destination. If the brakes are applied to prevent a too rapid descent on a down grade, motion is changed again to heat, and more or less of frictional electricity. In this illustration chemical affinity has caused light and heat, the heat has changed the water in the boiler into steam, and this has caused motion, and the train moves on; the brakes are applied and motion becomes heat, and more or less of chemical affinity and frictional electricity. This shows the correlation of the forces, and the change of the one into the other.

The finest mechanical subdivision of matter without chemical decomposition, is called a molecule; and atoms are the result when the molecule is reduced to its ultimate elements. The finest particle of sugar is a molecule, composed of carbon, hydrogen and oxygen; that is, three atoms—one of C., one of H. and one of O. A solid is composed of molecules or atoms, impacted together. A fluid is where the molecules simply touch each other, like round marbles in a vessel, and are free to move over each other, or in any direction among each other; while gaseous molecules repel each other, so as to occupy many hundred times the space that they occupied as a fluid. Water as steam occupies 1,700 times the space that it does as water, thereby leaving a "free path" for the occupation of other gases, and any other gas may occupy the intervening space, and be said to be diffused through it. The atmosphere is in a gaseous condition, the oxygen and nitrogen being mutually diffused through the space occupied, in the proportion of one of the former to four of the latter. They are in an atomic form, each atom independent of the others; they do not even touch each other; the atoms of oxygen repel each other, leaving a free path for the nitrogen atoms to pass between them, and the same is true of the nitrogen atoms; each being pure, free, uncontaminated and unallied, is

free to move and act, and to enter into and form any alliance that may present sufficient inducements for them to do so. There are but few substances with which oxygen does not unite under favorable circumstances, especially when the temperature is raised sufficiently high.

The foregoing scientific principles have been presented for the purpose of elucidating what is to follow; that certain deductions in Physiology may be better understood as being based on scientific principles. And when explained in agreement with these principles, certain vital phenomena or mysteries may not only be understood, but beheld as a wonderful manifestation of the wisdom, economy and beneficence of the divine Creator.

"In the foundation structure of the globe, firmness and stability are necessary prime qualities; while in the living structure instability and unceasing change are the marked characteristics."

Let us contemplate some of these changes.

In human physiology we find the soft tissues chemically composed of C., H., O., N., and the adipose tissue of C., H., O. The osseous structure is composed of (C_a O, C O_2), carbonate of lime .04 (3 C_a O, P_2 O_5), phosphate of lime .55 (M_g O, P_2 O_5), phosphate of magnesia .03, soda (N_2 O), potash (K_2 O), salt (N_a Cl), a trace of each.

These chemical componnds are found after a chemical analysis of the tissues, but as found in the living tissues are known by very different names from those just given, to wit: muscular, nervous, adipose and oseous tissue. Chemical molecules formed of C., H., O. or C., H., O., N., 3 C_a O, P_2 O_5 or of any other crude compound, as found in the inorganic kingdom, are not, and can never be used to build up vital structure, or to supply the natural waste incidental to life. No, the vital action of animal life is not designed for chemical synthesis, wherein the tissues are built up from the inorganic kingdom, or dead matter.

The vegetable kingdom elaborates from dead, decayed, or inorganic elements, the approximate elements of our food: we receive and appropriate them to our use, after they have been raised to life by the force of the vegetable kingdom. Animal life can only appropriate that which has been previously elaborated for its use by the vegetable kingdom. The inorganic compounds have a fixedness, a stability, an unchangeableness of character inconsistent with animal life, whose peculiar characteristic is constant change.

Digestion is but finely dividing the food eaten, and the reducing of it to a semi-fluid condition, so that it may be readily absorbed, and passed into the general store-house of nutritious matter—the blood. The results of the labors of the best original investigators, who study living matter with the highest powers of the microscope, show: 1st, "That nothing that lives is alive in every part." 2d, "That the substance of every living organism consists of three parts—1st, Pabulum; 2d, Bioplasm; 3d, formed matter." Take the oyster for an illustration; there is within the living organism that which moves, acts, eats, digests, and assimilates the pabulum, and throws off as formed matter that which makes the cell wall or shell. This shell is as much the result of vital action as is the living organism within, yet it is equally as dead as it is when you have polished and preserved it as a conch curiosity. The shell grows, but not in every part; the increase is only in the part next to the living animal.

"It is thus in every organic cell; there flows nutrient matter which is first changed to living matter, and then the living is thrown off as formed matter, to make the cell wall." In the center of the cell is the bioplast, which is the living germinal matter that is working this transformation. These bioplasts are so closely distributed throughout the organism that there are over 11,000 to the cubic inch. "These bioplasts are the only living matter, so that only about 1-5 is really alive; the other 4-5 being formed matter, somewhat like the shell of the living oyster."

In human physiology the nutrient matter must always be organic.

This physiological transformation of nutrient matter into living tissue is what chemistry can neither imitate nor explain; it is a vital process, and not a chemical one.

In animal vitality there are three vital actions that are mutually dependent on each other—brain force, respiration and circulation, "but the greatest of these three is brain force." Suspend the action of either of them but for a few moments, and vital action ceases. Notwithstanding the various complications and the multiciplicity of actions that go to make up animal life, they are ruled, governed and controlled by brain-force. A Prince Gortschacoff, of Russia, Bismarck, of Germany, Lord Beaconsfield, of England, and Gambetta, of France, are the men who dictate the policy of and really govern the Eastern world. Peter the Great, William the Conqueror, and Napoleon the I. were the real heads of their respective

governments, but as a rule but few of the crowned heads have sufficient mentality to be the real head of their own governments; but in the vital domain, brain-force is the ruling power, crowned high over all the vital actions, and without it there is no action, either voluntary or involuntary. Whence, then, is the origin of this brain-force?

Let us see:

We have shown that "instability and unceasing change are the marked characteristics of vitality."

In order that this change may go on unceasingly, and supply in quality and quantity sufficient to fill nature's demands, the air that we breathe becomes one of the prime essentials.

We have shown that the air is atomic in its character, and not molecular; that is, the O. and N. are diffused through the space occupied by our atmosphere, but each is truly as pure and uncontaminated by the other as potatoes and apples are when placed together; you may take which you will without fear of taking the other. It is so with the atmosphere; the lungs can and do as readily take the amount of pure oxygen that the case demands, as you could of apples mixed in a measure with potatoes.

The compound known as nitrous oxide gas is molecular in its character; there is no pure *oxygen* or pure *nitrogen* in it, as these elements exist in the atmosphere.

An atom of O. and an atom of N. are chemically united, so that they are neither one nor the other. They have been, so to speak, married, and must be divorced before they are free to form a new alliance. Such a gas may be inhaled, but does it decarbonize the blood? Does it subserve the vital demands, as does pure atmospheric air? We answer most emphatically, *No.*

We shall refer to this point again. The air we breathe is composed of O. 1 part to 4 of N. They are both inhaled; the O. is absorbed, the carbonic acid gas is discharged from the venous blood, and is exhaled with the nitrogen. The O. is conveyed by the red blood corpuscles, which are intermingled with the pabulum, and is carried through the heart, arteries and capillaries to every part of the body. The bioplasts appropriate the nutrient material to build up their respective tissues, and the oxygen becomes a part of the living structure. The O. is passed from within outward to the formed matter, which has been represented by the oyster-shell

illustration. The O. unites with this matter, decomposing a portion of it, when it is removed by the blood corpuscles as carbonic acid gas, and is conveyed in the veins to the lungs for elimination. Another portion is removed by the kidneys, and another by the lower bowels.

It will be seen that the O. acts on the formed matter, decomposing it as continuously as we breathe, sleeping or waking, from the first commencement of life until death. The building up of tissue is a *vital* act; the taking down is a *chemical* one, wherein the O. combines with the formed matter of the bioplasts breaking down the proximate principles as they are found in it, oxidizing it as it would any other dead matter raised to a sufficiently high temperature; it is removed as any other foreign matter is, and if not promptly removed, formed matter acts as a poison, and becomes a primary cause of disease.

As previously shown, chemical affinity is a primary source of heat, and it is this chemical affinity of the O. uniting with the carbon of the tissues that causes animal heat; and as this action takes place in every part of the body, we find animal heat everywhere present.

It has also been shown that science teaches, and our observations with the galvanic battery demonstrate, that chemical affinity is also a source of galvanic electricity. This generation of galvanic electricity takes place continuously as the oxidation of formed matter goes on, just as truly as it does in the oxidation of zinc in the galvanic battery. It may be asked what becomes of it. Is it wasted, or is it conserved and utilized for some good purpose? Let us see.

There are two sets of nerves:

1st. The afferent, that convey impressions from the periphery to the center; and,

2dly. The efferent nerves, that convey impression from the center to the extremities.

This galvanic or vital electricity is gathered up and conveyed to the brain, where it becomes vitalized, and is afterward known as brain and nerve force. If the breathing is suspended, the oxidation of tissue is suspended, and the development of vital electricity does not take place, and the brain deprived of its power, forthwith ceases to act. This cessation of vital action is death by suffocation.

The anæsthetic effect of the nitrous oxide gas is here explained on this principle. The gas being molecular in form, and not atomic, the lungs cannot divorce the alliance between the O. and N., so that the system is deprived of its due supply of pure O. to maintain the chemical action in the oxidation of formed matter necessary for the generation of vital electricity. The brain not being supplied with the force requisite to carry on the vital processes, the condition becomes an approach toward death, and a loss of consciousness is the result. Carbonic acid gas from burning charcoal, is an anæsthetic, too, and one of the most dangerous in character, yet its action is explainable in the same way.

During sickness, the build-up of tissue may not take place for many days, and yet recovery take place; but during life the break-down of tissue must and does take place, continuously, or death is the result.

We see that the build-up of tissue is essential to life, and we now see how the break-down is equally essential to vital action, as is the build-up, and wherein nature conserves all her means for the com mon good of the whole.

Does science bear us out in our deductions? Let us see.

Light, in its motion, passes in waves 500,000 to the inch, crossing back and forth across the axis of its course. When it strikes an obstruction it may be absorbed, arrested, reflected or refracted, according to the nature of the obstruction. These waves are a motion in a celestial ether, that is supposed to pervade all space, however remote.

Sound is also transmitted by waves, but in a very different manner and by the atoms that constitute the air. These atoms are held in their relative position to each other by mutual repulsion—that is, they do not touch each other, but each holds the other at arm's length, so to speak, and when an impulse is made, that produces a sound—the first atom of air is forced toward the second, causing a condensation—that is, the atoms do not touch each other, but are nearer than their repulsive natures allow them to remain; so No. 1 is forced back to its original position, but instead of stopping there it passes beyond, thus leaving a rarified condition of the atoms. Thus the wave is propagated from atom to atom; first condensed and then rarified; thus sound passes along by the oscillating motion of the atmospheric atoms.

There is a marked distinction between the motion that constitutes light, and that which constitutes sound. They are not interchangeable. They require two distinct senses to take cognizance of them.

In the motion that constitutes electricity there is still a marked difference.

For illustration, suppose a series of ivory balls to be suspended in a row so as to just touch each other.

Now, if the first ball is withdrawn from the second a few inches, and then allowed to return suddenly and strike ball No. 2 with considerable force, the ball No. 2 does not move from its place, but transmits the blow to No. 3, and this to the next, and so on to the last ball in the row, which, having no one to transmit it to, is thrown from its fellow a distance proportionate to the force with which No. 1 struck No. 2.

In the working of the electric telegraph, the atoms of the iron wire that transmit the electricity do not move, but the first atom receives the force and it is transmitted from it to the next, and so on to the last one, where there being a break in the connection the force is manifested. This is the present explanation of galvanic motion as we understand it.

The analogy between galvanic electricity and nerve force is apparent when considered in all its various manifestations.

Let us consider a few of them:

1st. Some persons are so abundantly supplied with nerve force or vital electricity that they are like a charged Leyden jar, and have been known to pass to another a sufficient quantity of electricity to produce a spark that could be both seen and heard.

2d. Some time since an explosion took place in a mine that could be accounted for only on the supposition that it was occasioned by vital electricity.

3d. The arteries are tubes where the blood is continuously circulating or changing its relative position as to place; but in the nerves there is no such change of position of the matter that constitutes their interior. What ever the motion is, it is the transmission of an impulse that makes an impression on consciousness at the termination of the nerve fibre, as was the case with the suspended balls of ivory.

4th. In the use of the galvanic battery on a person.

If the current is not so strong as to overload the nerves, already

charged with the vital current, and if it is passed in the direction of the natural flow, it is transmitted without pain; but pass the current in the opposite direction to the natural course of the nerves, and pain is the result. In the normal condition of vital action, the impulse is in quantity just enough to supply the demand, and is continuous in its flow, which is always in the same direction.

A lightning rod will conduct the electric charge from the cloud to the earth in the same quiet and unobserved manner; but over charge it. and the rod is melted and destroyed. So if the current of the battery employed is too strong, or if it is passed in the wrong direction pain is the result.

The afferent nerves convey the vital electric current from the peripheries to the center and also sensations in the same direction.

The efferent nerves carry will power or brain force to the muscles, and cause them to contract. Suspend the current and the muscles relax. In like manner the telegraph, when the connection is complete, acts as a messenger, and attracts; but as soon as the connection is broken it ceases to act.

When the current of artificial galvanic electricity passes in the afferent nerves from the extremities toward the center, or in the direction of the natural current, it passes like a vessel down stream; but when it is forced to pass in the opposite direction, it is like forcing the vessel up stream against the powerful flow of the river. A ruffled wave and a resisting current is the result, and pain, the shriek of suffering nature for relief, is most emphatically realized.

It is apparent to every careful observer, that but few persons of their acquaintance become very wealthy by their own exertions; those who are comfortably situated are many times more numerous; but the masses are those who are dependent on manual labor for the support of themselves and their families. A few are bankrupt, and others are dependent on charity for their daily bread.

It is so with the "genus homo."

The bankrupt is the one of all others who demands our commiseration, as the poor do our charity.

Such persons are so prodigal of nerve force that the build-up of tissue is insufficient to supply the break-down, as fast as they expend it, for the generation of vital force. They are, consequently, nervous bankrupts, although the break-down may go on so rapidly that they become walking skeletons.

The use of the galvanic battery to supply this deficiency is like administering phosphate of lime to a child who has a deficiency of that indispensable article in its osseous structure.

If you would nourish bones that are deficient in the phosphates, you must use that part of the cereals which contains it in the greatest abundance in an organized form, so that it can be appropriated for that use.

A distinction exists between organic and inorganic—the artificial and the natural—when the vital organism is to use it. The same principle will apply to the use of the galvanic battery; its judicious use may increase vital action, and indirectly supply nerve force by increasing, in a natural manner, the break-down of tissues; but never by a direct supply of it to the brain or nerves.

There are persons who are so abundantly supplied with vital force that they are enabled to impart it to others, as a banker may supply funds to the bankrupt; and if the nerve bankrupt be properly instructed as to the conserving of his nerve force, he may be benefitted thereby; but if, like the natural-born spendthrift, he expends all his own nerve force, and all he can obtain from others, as fast as he can obtain it, such an imparting of one's vitality is "love's labor lost," and a useless expenditure.

CONCLUSIONS.

In the inorganic world firmness and durabillty are prime qualities, while in the organic living structure instability and unceasing change are the marked characteristics.

In the inorganic world we see that the sum of all the forces culminates in light, or the greatest degree of motion; equal to 192,500 miles a second. In living structure the climax of all the forces is life; with a moderate degree of continuous action. from the first inception of vital motion till it ceases in death.

The living principle is an active force, or a sum of active forces, and the result is a continuous action, which is life. The cessation of this activity is death.

Health is where the action is in perfect balance in all its parts.

The cause of disease is a loss or disturbance of this balance, and disease is nature's effort to restore the balance; while death is the cessation of vital changes.

Nature's law of life and cure is true obedience to physiological law.

ANIMAL GRAFTING—ITS THERAPEUTICAL APPLICATION TO CERTAIN LESIONS OF THE DENTAL APPARATUS.

BY DR. E. MAGITOT.

[*Read before the French Academy of Science, January* 6, 1879. *and translated for the Missouri Dental Journal, by F. Frizelle.*]

In a previous communication I presented to the Academy, in common with the regretted physiologist, Ch. Legros, cases of the grafting of dental follicles in certain species of mammals. To-day I will touch upon another problem—that of the grafting of adult dental organs, and this time the results favor experiments of a more practical nature.

Grafting, as practiced with the dental organs, is divided into several varieties. The first category comprehends the grafting of teeth taken from their own alveoli, and replaced either immediately or after an indefinite period of time. This is *grafting by restitution*. In a second group are placed those teeth which are taken from one alveolus and transplanted into another, either in the same subject or in a different one. This is *grafting* by *transposition*. Finally, in a third category are placed cases of the grafting of teeth in different points of the body otherwise than the jaws. The experiments of Hunter, A. Cooper, Philipeaux and others, are examples. This is *heterotopic grafting*.

In the present communication I will confine myself to presenting cases of grafting by restitution, but comprehending a particular variety; that of raising an organ from its normal connections, removing by resection the diseased part, and restoring the remaining healthy portion to its primitive place. This is a combination of grafting and resection.* My experiments run back only to 1875. The first three were published at that time (Gazette des Hopiteaux 1875, p. 35 et suiv.) Others figure in the inaugural Thesis

* The first attempt of this kind was made by Dr. Delabarre, who having removed a tooth on account of abscess and fistula, excised a part of the root and replanted it with success. (Annals du Cércle Medical, 1820, 1re partie, p. 323.) The second was that of Prof Alquié, of Montpellier, who in 1858 cured by the same operation a fistula in the chin, of long standing. (Bulletin de Therapeutique, 30 Mars, 1858.)

of two of my pupils, Dr. Pietkiewicz (Thèses de Paris, 1876) and Dr. David (Thèses de Paris, 1877). To-day the number of these operations attains the figure of 62.

The surgical indication of grafting combined with resection rests essentially on the diagnosis of a special lesion at the apical extremity of the teeth, characterized by *chronic periostitis* at this point: that is to say, inflammation of the periosteal membrane, denudation and necrosis of the sub-jacent cement, and resorption of the dentine—a kind of mortification of the root. The morbid processes are manifested by the following series of accidents: Inflammation of the gum or the face, denudation and necrosis of the alveolar border, mucous or cutaneous fistulæ, etc. These accidents sometimes take a chronic, sometimes an intermittent form, and if abandoned to themselves, may result in grave disorders, deformities and cicatrices of the face, and general affections which may endanger the life of the patient. The therapeutical remedy in case of a lesion thus defined, is the removal of the mortified apex of the root which is the inciting cause of inflammation. Now, this suppression not proving effective directly, it becomes necessary to remove the entire organ in order to effect externally the removal of the diseased portion, At this period the operation of grafting comes in, which causes the restoration of the remaining healthy portion to its primitive place.

The manipulative process comprehends three parts: 1st. Total ablation of a tooth on which chronic periostitis of the apex has been diagnosed. 2d. A surgical resection of the diseased portion. 3d. Immediate re-implantation.* The rest of the operation consists in the sometimes necessary application of bandages (retaining appliances), draining of purulent collections, the removal of necrosed alveolus, etc. But the last part of the operation is very simple. When the consolidation of the grafting is effectual, there is a slight local reaction, but little or no general phenomena; the fistulæ close, the collection dries up, and the complete consolidation is accomplished in a time varying from eight to fifteen days. When, on the contrary, the operation is unsuccessful, the grafted tooth drops out in a few days from suppuration.

* Incidentally between the second and third operations, the surgeon can, before grafting, perform other operations: washing out the purulent collection, ablation of sequestrum, and on the tooth even, resection of certain portions of the crown, obturation in case of caries, etc.

The success I have had in this method of operation is shown by the following figures: 62 operations have been performed, 57 cures effected—that is to say, an average of success of about 92 per cent.*

Conclusions.—1st. Chronic periostitis of the apex of the roots of teeth, complicated with neighboring lesions, inflammation, abscess, denudation, maxillary necrosis, fistulæ, simple or compound, hitherto treated by simple ablation, is not beyond the resources of conservative therapeutics.

2d. The treatment consists in the resection of the affected portion of the root after the temporary removal of the tooth, followed by its immediate re-implantation—or grafting by restitution.

3d. The result of the cure is the cessation of all disease, the firm adherence of the organ, the complete return of its vascular connections and the re-establishment of its usefulness.

THE AID WHICH MEDICAL DIAGNOSIS RECEIVES FROM RECENT DISCOVERIES IN MICROSCOPY.†

BY C. HEITZMANN, M. D.

A few months since I had a conversation with a renowned physician of this city, in the presence of an intelligent cloth manufacturer, about the great value of the microscope, especially in the practice of medicine. The physician laughed at me, and asserted the science of microscopy to be good for nothing, because of its low development, its unreliability with regard to new discoveries, etc. The layman turned towards the physician, and said: "Doctor, you are very much like an engineer, who is destined to remedy alterations of a wonderfully complicated machine, without knowing anything of its structure." It strikes me that the manufacturer has

* Of cures dating from two years and a half back, those of the last two years especially, figure largely in our reports. The age of the subjects does not appear to exercise any influence on the results, and all kinds of teeth have been alike subjected to this process. In a large number of cases periostitis of the apex was not accompanied by any concomitant caries; in others co-existent caries was removed before re-implanting the tooth.

† Read before the N. Y. County Med. Soc., December 23d, 1878.

found the truth. In fact, a physician, who is not well posted in anatomy, both macroscopical and microscopical, is on the same level with an Indian medicine man, who dabbles all the time in therapeutics, and when asked why he gives a certain herb in one disease and a certain mineral in another, refers to his experience only, without the least scientific foundation. * * * * *

The standard doctrine of "cells" and the "cellular pathology," has proved unsatisfactory indeed. No thinker could ever have been content with the principles of the cell-doctrine, and every one is aware of the little advantage medicine has gained from the cellular pathology.

To-day the cell-doctrine is surpassed by new discoveries. Instead of looking at the shape of the "cell," we have learned to study the minute structure of its mass, the so-called protoplasm, of which we know that it represents a constituent part of the organism.

That the new doctrine, for which has been proposed the term "Bioplasson-Doctrine," has really arrived at a certain point of perfection, I presently intend to demonstrate.

* * * * * * * * * * *

The microscope plays an important part in the examination of morbid new-growths, and I fully concur with Prof. Lucke of Strassburg, in the desire that every practitioner should be acquainted with the minute structure of tumors, which would enable him to give a more correct diagnosis and prognosis than is the case at present. Very often we decide about the future of the patient through microscopical examination of tumors, either after extirpation or before it, when small parts of the tumor are cut out for diagnostic purposes.

We know that there exists a series of tumors, the so-called benign ones, which do not materially interfere with the health of the patient. Such tumors are either formations of connective tissue, with fully developed basis-substance in its four main varieties, viz.: myxomatous, fibrous, cartilaginous, or osseous, such as myxoma, fibroma, chondroma, and osteoma. Or the tumors represent imitations of fully developed tissues, arisen from the middle layer of the embryo, such as angioma, lipoma, neuroma, myoma; or, lastly, they are combinations of epithelial and connective tissue, such as papilloma and adenoma.

Another series of tumors, on the contrary, being called malig nant, have a deleterious influence upon the constitution of the patient. They grow rapidly, are painful, liable to ulceration, recur very often after extirpation, and produce secondary tumors in in· ternal organs. . For the differentiation of these growths we are greatly indebted to R. Virchow. He has first cleared up the fact that some of these tumors are formations of connective tissue in its undeveloped, or embryonal, or medullary condition, for which he proposed the rather poor denomination "sarcoma;" while others are combinations of epithelium and connective tissue, the so-called cancer forms. A third variety of tumors exhibits intermediate stages between the two kinds, and they represent what is termed a popu- lar expression, suspicious tumors, such as myxo-, fibro , chondro-, osteo sarcoma, etc. These tumors, upon their first appearance, do not impair the constitution of the patient; but in turn, or after re- peated extirpations, or rather trials of extirpation, become decid- edly malignant.

The study of the minute anatomy of tumors, in its present con- dition, is as yet far from being satisfactory. Still, if the question should be raised, whether microscopy has advanced so far as to give a thorough decision of the benign, suspicious, or malignant nature of a tumor, the answer doubtless will be a hearty: Yes, it has.

There are but very few points worthy of consideration as to the nature of a tumor. The more of a basis-substance of the above description is present, the smaller, therefore, the amount of free protoplasmic bodies, the surer it is that the new growth is of a be- nign nature. On the contrary, the smaller the amount of basis- substance, the larger the relative number of protoplasmic bodies, the more certainly does the tumor belong to a malignant type. The very worst tumors, glioma, round-cell-sarcoma, and medullary cancer, exhibit a rather trifling share of fibrous connective tissue. The difference mentioned, namely, is true not only for sarcoma, but also for cancer. The more the connective tissue prevails in com- parison with the epithelial formations, the less malignant in its course, the more we are entitled to term it a "Scirrhus;" while in the fast growing and rapidly killing medullary cancers, the frame of connective tissue, bearing the blood-vessels is very small, and the epithelia are ill-developed, viz., remain in their medullary or em- bryonal condition.

Combinations of fully developed basis-substance, with partial retention of the embryonal character, are by no means rare; they involve what is termed the suspicious nature of the tumor. These tumors allow of a prognosis of recurrence after extirpation, or of a gradual change for the worse, when the surgeon, judging from the appearances to the naked eye, has not the slightest idea of the threatening danger. The inflammatory process in even benign tumors may mislead the microscopist in rather exceptional instances, and it is only by a thorough examination of different parts of a tumor that a correct decision as to its nature is justified. The presence of inflammatory elements within the connective tissue frame of cancer is well known to be decisive of its malignant nature, and the circumstance that such elements not rarely can be found on the surface of an extirpated cancer-tumor, indicates on the one hand that recurrence will rapidly ensue, on the other hand that such elements play an important part in the new growth of epithelia, characteristic of cancer.

I have examined numerous tumors, both in small excised pieces for test, and after extirpation, and often had to contradict the views of the attending surgeon. I cannot tell, of course, how far my diagnoses were correct in all instances; but so far as prognosis is concerned, I very rarely was mistaken. I would illustrate my assertion with only one case, this being the most recent one. Dr. Louis A. Duhring, of Philadelphia, exhibited at the meeting of the Amer. Dermatol. Association in Saratoga last August, a remarkable case of tumors of the skin on a lady. This lady had evidently a healthy constitution, and the tumors bore all clinical features of benign—nay, only inflammatory formations. A few weeks since the doctor sent me a number of sections from one of the tumors for microscopic examination. I found the characteristics of a fibro-sarcoma, formerly called recurrent fibroma, and though I had not seen the patient since August, and not heard of her, I wrote to the doctor that the tumors, sooner or later will interfere with the health of the lady, and, turning to the worse, exert their deleterious influence upon her constitution. The doctor several days ago wrote me a letter, stating that the health of the lady is failing more and more since she left Saratoga.

In 1873 I published the results of my researches on protoplasm in the Transactions of the Imp. Acad. of Sciences of Vienna, an-

nouncing that the protoplasm has a reticular structure. Each protoplasmic lump, in a certain stage of development, exhibits numerous conical threads, emanating from the nucleus, and inosculating with the neighboring granules of the protoplasm. All granules are connected with each other by extremely delicate threads, so much so that the granules must be considered as the thickened points of intersection of a network which traverses the mass of the protoplasm, and is in connection with a thin, uniform layer, bounding the whole lump. I declared that the nucleus, the granules, the uniting threads, and the inclosing shell, are formations of the living matter, while the substance filling the meshes and the vacuoles is a fluid, and as such, devoid of life.

At that time I was quite alone in my assertions. Shortly afterwards J. J. Woodward, of Washington, published micro photographic plates of cancer specimens, on which, wherever the protoplasm was in a right focus—unfortunately this is but exceptionally the case in micro-photographs,—the network in its interior was plainly visible. The first good investigator, who corroborated my discoveries in every respect, and announced this publicly, was Dr. Louis Elsberg, of New York. To-day over a dozen of the best microscopists abroad, agree with me in the view of the reticular structure of the protoplasm, though a number of them have studied this in nuclei only. But a few have accepted the doctrine that the network itself is a formation of the living matter.

Living matter has two characteristic properties, viz., motion (change of shape, amœboid motion, and change of place, locomotion), and the capacity of producing its own kind (nutrition, growth and generation). These properties are due to the network in the protoplasm also. We see the network changing its shape and place during the amœboid motions and the locomotions of the protoplasmic lump in an amœba, a colorless blood corpuscle or an isolated or connected protoplasmic body of any description. Recently L. Elsberg has discovered in my laboratory that also the colored blood-corpuscles exhibit the reticular structure of protoplasm after the colored substance, held in the meshes, is extracted by a dilute solution of bichromate of potash. The colored blood-corpuscles under these circumstances demonstrate slow, but distinct amœboid motion. The growth and new formation is observable on the granules of the living matter within the protoplasm during

the growth of the whole body and in the inflammatory process, where the endogenous and exogenous new formation is based altogether upon the increase of the living matter.

The amount of living matter within a limited bulk of protoplasm varies greatly in different individuals. It is obvious that what is called a healthy or vigorous constitution, is based upon a large amount of living matter in the body, the new growth of which, in morbid processes, is very lively; while a strumous or scrofulous or phthisical constitution must be caused by a relatively small amount of living matter, the new growth of which is scanty in morbid processes. In other words, a lump of protoplasm will exhibit coarse granulations, or it will be almost homogeneous looking under the microscope, owing to the large amount of living matter in strong individuals of good constitution, while the protoplasm taken from a person with weak or strumous constitution will be finely granular, as but little living matter is present in it.

Two years ago I had the pleasure of announcing first before this society that pus-corpuscles show remarkable differences in their minute structure in different individuals. Those from otherwise healthy and strong persons are yellow, almost homogeneous or coarsely granular, I said, while those arisen from broken-down, weakened or strumous persons are pale, gray and finely granular. This fact has been made use of in hundreds of cases, when pus-corpuscles, mainly in urine, were brought by different physicians in my laboratory for examination, for telling whether the pus belongs to a good or bad constitution, of course without any knowledge of the patients themselves. I was right in every instance; not one mistake has occurred.

About one year ago I announced before this society that also the colorless blood-corpuscles demonstrate striking differences as to their minute structure, according to the general constitution. I said that the colorless blood-corpuscles are coarsely granular and slow in their amœboid motions under the microscope, if taken from healthy, vigorous, strong persons; on the contrary, they are pale gray, finely granular, viz., poorly provided with living matter, in broken down or phthisical individuals. I expressed my hopes that at some future time practical use might be made of these differences. To-day my hopes have turned, after three years' earnest study, into accomplished facts.

The method of examination of the blood for our purpose is extremely simple. We oil the edges of a thin covering glass on one side with a curled piece of paper, serving as a brush. Prick with a pointed pin the palmer surface of the thumb, near the wrist joint, this giving a good convex surface, and being least incommoded by the injury. Squeeze out a small drop of blood, the size of which has to be learned by some practice. Put the glass slide on the drop for transportation, and immediately cover up the specimen with the covering glass, the oiled edges looking toward the slide. Such a specimen holds the blood in a living condition at least one hour It is not necessary to use the heated stage, because the colorless blood-corpuscles exhibit their structure in an ordinary, comfortable temperature of the room, nay sometimes show slight amœboid motions. The magnifying power should be at least 800 diameters, the lens to be used being best a one-tenth of an inch immersion. As a matter of course, it ought to be a first-class lens, such as are manufactured by Hartnack and by Verick in Paris, by Tolles in Boston, by Grunow in New York, and by a few other opticians, whose lenses I have not as yet sufficiently tested for direct recommendation. Considerable skill is required for such studies, which embrace first the knowledge of the structure of the protoplasm in general. A few months, nay, a few weeks' thorough study under the direction of a reliable teacher will suffice to enable everyone to see what really can be seen in the protoplasm, and to entitle him to judge also of the differences. I never had difficulties in demonstrating the network of protoplasm to anyone who was in earnest with his microscopical studies, and took them for more than play. After having obtained a certain practice, one is enabled to tell differences in the anatomy of the colorless blood-corpuscles with a power of 500 diameters only.

Several years ago I was first struck by the fact that the elements establishing the condition of catarrhal pneumonia and of tuberculosis, both acute and chronic, are decidedly pale and finely granular. Next I learned that pus and colorless blood-corpuscles of strong men are partly homogeneous, or at least coarsely granular. Then I followed these studies by examining the blood of different physicians who came to work in my laboratory (their number, since I established the laboratory four years ago, exceeds three hundred), and who could give reliable histories of both their families and their

own bodies. Thus I have arrived at a point of perfection, which allows me to tell the constitution of a person without knowing any thing of his former life.

Besides the differences in the structure of the colorless blood-corpuscles, as described above, valuable hints may be obtained from other circumstances. The number of colorless blood-corpuscles in a given drop of blood is surprisingly different in different persons; the better the constitution, the fewer are these bodies. A sleepless night, however, is sufficient to increase their number, which fact often enabled me to tell physicians by examination of their blood, whether business is going slowly or lively, the latter inducing sleepless nights, or repeated awakening by patients, or so-called nervousness.

Catarrhal processes, so-called colds, of any of the mucous membranes, lead to an increase of the number of the colorless blood-corpuscles; a chronic condition of these processes is indicative of a poor constitution *per se*. The colored blood-corpuscles greatly vary in their yellow tinge in different persons; the paler this tinge is, the more readily we can tell pale looks of the face or chlorosis. The colored blood corpuscles stick together in coin-like rows only when the plasma holds a larger amount of fibrin; in the blood of persons with a poor constitution, such rows do not occur; in individuals of moderate vigor, the rows temporarily may be missing, at other times present. In the blood of persons of good constitution who had passed through severe ailments, I several times found both coarsely and finely granular colorless blood-corpuscles, just as in originally healthy persons, who, by chronic diseases, become broken down.

In fact, the microscope reveals so much of the general health of a person, that more can be told by it in many instances than by the naked eye, or by physical examination. Life insurance should be based upon microscopical examination, as well as on percussion and auscultation. Marriages should be allowed in doubtful cases, only upon the permit of a reliable microscopist. Last season a young physician asked me whether I believed in the marriage among kindred? He fell in love with his cousin, and so did the cousin with him. I examined his blood, and told him that he is a "nervous" man, passes sleepless nights, and has a moderately good constitution. The condition being suspected in the kindred lady,

marriage was not advisable for fear that the offspring might degenerate. So great was his faith in my assertions, that he gave up the idea of marrying his cousin; offering her the last chance, viz., the examination of her blood. This beautiful girl came to my laboratory, and, very much to my surprise, I found upon examination of her blood, a first-class constitution. The next day I told the gentleman, "You had better marry her."

As a matter of course, every particle of the organism, either in a normal or in a morbid condition, will exhibit characteristics as attributed to the colorless blood-corpuscles. The protoplasm is one uninterrupted mass throughout the body, and the living matter is connected from the top of the head to the heels, in what we call tissues. Several months ago, Dr. Paul F. Munde brought me a specimen of the size of a pea, which, he said, he found in a large amount of fluid blood vomited out half an hour before by a patient. After immediate examination of a section from the specimen, I told the doctor that his patient was a pale, emaciated, narrow-chested person, who had catarrahal pneumonia, which led by localized gangrene to sloughing of the piece of the lung, on which a broken bloodvessel was visible. I foretold, besides, that the patient will die within one year. I explained to the doctor and to Dr. L. Elsberg, who also was present in the laboratory, what led me to such a diagnosis and prognosis. There were visible alveoli of the lung, and both the walls of the alveoli and their calibers were crowded with inflammatory elements, coagulated fibrin being absent. These are symptoms of catarrhal pneumonia. On some parts clusters of micrococci could be seen,—characteristic of putrefaction, therefore gangrene of the tissue. The inflammatory elements looked very pale and finely granular, the evidence of a bad, phthisical constitution, and all these signs together allowed the diagnosis of a limited viability, hence the disastrous prognosis. The doctor told us that no physical symptoms could be found in the lungs, justifying my diagnosis. Still he admitted right away that the patient was a pale-looking, thin and narrow-chested young man, whose brother had been sent to Florida some time ago for chronic tuberculosis of the lungs. One week afterward the doctor came to tell me that the physical symptoms at present were so marked on the lungs, that the diagnosis of catarrhal pneumonia was evident. Seven weeks afterward the patient was dead.

The facts here laid before the medical profession, may convince even the most sceptical physician that microscopy is destined to play an important part in the science of medicine. Let us proceed in skillful honest work, and we shall succeed in raising the standard of microscopy still higher, and make it not only a valuable, but rather an indispensable assistance to clinical work. Much more could and should be done in this country by the profession at large, than is done at present, for the perfection of that most interesting and useful science, the science of ourselves,—Biology.—[*Abridged from Archives of Medicine.*

ELEMENTARY LESSONS IN ELECTRICITY.

BY A. FLOYD DELAFIELD, A. B.

It is my intention in these papers to draw up an outline of the principles of electricity, as concise as clearness permits, which shall afford to those using electrical apparatus sufficient information to enable them to select such apparatus with judgment, and apply it to best advantage. In this number I shall explain some of the terms employed in the science, and describe a few experiments which illustrate the meaning and use of the terms. In subsequent numbers I shall describe the different forms of apparatus used for the production of electricity, and explain what results may be expected from each, giving particular attention to the selection and arrangement of batteries, and the different effects produced by differences in the number and size of their elements.

It is hoped that this series of articles will meet the wants of those who, while desiring exact and accurate information about electricity, cannot spare the time to study elaborate treatises.

I. 1. Electricity is a form of energy. It cannot be defined, but is described by enumerating the phenomena it produces, such as attractions and repulsions, magnetic, chemical, physiological and other phenomena.

There are several ways of developing electricity.

a. By rubbing dissimilar substances together.

b. By placing dissimilar substances in contact or in a liquid.

c. By warming or cooling the junction of two dissimilar substances.

d. By changes in a system of magnets and wires, either in the strength of the magnets, or in the relative position of the parts of the system.

Besides these methods there are others not practically used.

The terms frictional electricity, galvanic electricity, magneto-electricity, etc., often employed, refer to electricity produced in different ways, and not to different kinds of electricity. We know of but one kind of electricity, whatever means may be employed to produce it.

2. A body having more or less electricity than the earth near it, is said to be electrified. If it has more than the earth, we say it is positively electrified, if less, negatively.

The degree of electrification of a body above or below the earth near it, irrespective of the size or nature of the body, is called its potential. It is analogous to temperature, which is also an idea independent of mass.

The course of differences of potential is called electromotive force. The unit or standard of electromotive force is called a volt, and is about equal to the electromotive force produced by any form of sulphate of copper battery. We say, for instance, the electromotive force of a certain battery is two volts, just as we should say the weight of an apple is six ounces, or the capacity of a tumbler is half a pint.

In any electrified body there is a certain quantity of electricity which can be measured.

The quantity of electricity which can by any means be gotten into a body is limited by its capacity, which depends on its surface —a hollow ball having the same capacity as a solid one.

The capacity of a body is affected by neighboring bodies.

3. If two bodies of different potentials be connected by a wire, the excess of electricity above the mean of the two passes from the body of higher to that of lower potential, and we say, a current of electricity passes from the first to the second.

When we speak of the strength of a current, we mean the quantity of electricity that passes per second.

It is found that the nature and size of the wire joining the two bodies of different potential, affect the strength of the current.

The degree to which the wire opposes the passage of the current is called its resistance, and is independent of the strength of the current.

Bodies of small resistance are called conductors. Those of very great resistance are called insulators.

The unit or standard of resistance is called an ohm, and is practically a certain piece of wire kept at Kew in London, exact copies of which have been sent all over the world, and are used for measuring the resistance of coils of wire, and for other purposes.

In measuring resistances we use a set of wires of one, two, etc., ohms resistance, just as in weighing we use a set of weights of one, two, etc., pounds or ounces.

4. If two bodies at different potentials be connected by a substance having a very high resistance, such as air, glass or india rubber, the potentials of the two bodies do not become equal; a certain quantity of electricity passes into the air or glass, or other insulator, and then the whole system attains a condition of equilibrium.

5. Electricity in equilibrium is statical electricity.

Electricity in motion is dynamical electricity.

A mass fixed at any height above the surface of the earth, possesses energy similar to statical electricity.

A mass falling from such a height possesses energy similar to dynamical electricity.

II. Methods of producing electricity.

In treating of the methods of producing electricity, it is convenient to speak first of friction, although for the production of electricity for practical purposes, this method is never, or at least seldom, used. There are certain very important experiments however, which are most conveniently made with frictional apparatus. In making these, dry weather must be chosen, as a damp atmosphere is a conductor of electricity, and in such an atmosphere no great difference of potentials can be maintained.

The simplest form of frictional machine consist of a piece of glass, hard rubber, or sealing wax, and a piece of silk or catskin. On rubbing one of the first mentioned bodies with one of the second, electricity is developed in both of them. The potential of one is raised, and that of the other lowered.

If the electrified glass or other substance be held near some light body, this will be attracted to it, but as soon as it has touched the glass or other electrified body, it will be repelled

This simple experiment is the basis of the whole science of electricity. It is most convenient to make it in the following way:

Provide three glass standards a few inches high, bent in the shape of a small Roman f, and fixed in wooden or metal bases. Let us call them numbers 1, 2 and 3.

Now from 1 and 2 suspend single small balls of pith by fine silk threads, so that they hang free, and from 3 suspend in the same way two balls so that they touch each other. Let us also have a rod or tube of glass a few inches long, a stick of ordinary sealing wax, and a piece of silk, such as a handkerchief. We can now make the following experiments:

1. Rub the glass or sealing-wax briskly with the silk handkerchief, then hold it to ball No. 1. The ball is attracted, but as soon as it has touched the rod, it is repelled.

2. Rub the rod again, and hold it then to the pair of balls No. 3. They behave as did the single ball, but on allowing them to touch the rubbed rod and then removing this, they will come to rest, not touching each other however, but standing off from one another.

3. Bring 1 and 2 near each other. Touch No. 1 with the glass rod, after this has been rubbed, and touch No. 2 with the rubbed sealing-wax. The two balls will now attract one another, but if they be allowed to touch, they fall apart again and lose all sign of electrification.

From these experiments we see that:—

1. An electrified substance attracts a light non-electrified body.

2. An electrified substance repels a body that has touched it.

3. A body touched by rubbed glass or sealing wax, repels one touched by the same substance, and attracts one touched by the other substance.

It is by carefully making such experiments as these, that the following laws have been demonstrated:—

1. On rubbing glass and silk together, the potential of the glass is raised and that of the silk lowered.

2. On rubbing sealing-wax and silk together, the potential of the sealing-wax is lowered, and that of the silk raised.

We know of no reason for this, any more than why electricity should be produced at all in either case, we can only say, such are the facts.

3. On bringing an electrified body in contact with one of a differ-

ent potential, a portion of the electricity passes to the body of lower potential. It is for this reason that we can electrify the suspended balls by touching them with the rubbed rods of glass and sealing-wax. This also explains the fact that the two balls touched, one by glass of raised potential, and the other by sealing-wax of lowered potential, lose all sign of electrification on touching each other The potential of one has been raised, for the glass touched it, electricity went into it—that of the other lowered, for electricity passed from it to the sealing-wax. Now on bringing the balls together, supposing them to be of one size, all the electricity passes from the ball of higher potential to that of lower potential, and they are thus brought to the potential of the earth, that is, they are both at the potential zero; are not electrified at all.

4. Two substances, the potential of both of which is higher or lower than that of the earth, repel each other—if the potential of one be higher, and that of the other lower than that of the earth, they attract each other.—*Ibid.*

OBITUARY.

We are indebted to the courtesy of the *Dental Cosmos* for an advance sheet containing the following obituary notice. Our readers will appreciate the kindness.—[ED.]

PROF. JOHN HUGH MCQUILLEN, M. D., D. D. S.

SUDDENLY, on March 3, 1879, died, DR. JOHN H. MCQUILLEN, in the fifty-fourth year of his age.

Dr. McQuillen was born in Philadelphia, February 12, 1826. He was the son of Captain Hugh McQuillen, who served under Decatur during the war of 1812. The ancestors of his mother, Martha Scattergood, came to America with William Penn. He received his early education in the Friends' school in Philadelphia, and at the age of sixteen entered as clerk in an importing house with the purpose of devoting himself to commercial pnrsuits. His tastes, however, inclined him to medicine, and after attaining his majority he com-

menced its study in the Jefferson Medical College, from which he graduated in 1852. Meantime he was also studying dentistry, and in 1853 he received the honorary degree of D. D. S. at the first commencement of the Pennsylvania College of Dental Surgery. In 1857 he was elected to the chair of operative dentistry and dental physiology in the Pennsylvania College of Dental Surgery, holding that position for one year, and relinquishing it to take the chair of general anatomy and physiology, which he resigned in 1862. In 1863, principally through the efforts of Dr. McQuillen, a charter was obtained for the Philadelphia Dental College, of which institution he was made dean and professor of physiology, retaining both positions until his death. In 1859 the publication of the *Dental Cosmos* was commenced, Dr. Mc Quillen becoming one of its editors, which relation was continued until his retirement in 1871.

Dr. McQuillen has been a frequent contributor to the literature of the profession from his first connection with it, and has held important positions in various dental societies, including the presidency of the American Dental Association, of the Pennsylvania State Dental Society, and of the Odontographic Society of Pennsylvania.

As an operator Dr. McQuillen was recognized as possessing more than average skill, supplemented by an earnestness and conscientiousness which were a guarantee of faithful service.

As a teacher he was enthusiastic and ambitious, laboring to the best of his ability to prepare those whom he instructed for the intelligent and successful practice of their vocation. Hundreds of the alumni of the institutions in which he taught will hear of his decease with sincere sorrow.

Dr. McQuillen was by nature an organizer. To his organizing faculty, as well as to his zeal, energy, and tact, the success of the Philadelphia Dental College is largely due, and it was these qualities which caused him to be recognized as a power in the profession at large. If ever any man was consecrated to the chosen work of his life, John H. McQuillen was. He devoted to the original organization of the American Dental Association, to its development and to the general educational interests of the dental profession, the best efforts of his life. Other men may be found of greater natural gifts, of larger attainments, and of more brilliancy, but none who have contributed more freely, more constantly, more unselfishly to the

general good. And though he possessed personal gifts and graces which won the respect and esteem of a large circle of friends, professional and otherwise, who will hold his memory in affectionate remembrance; though he was courteous, genial, and kindly in spirit and manner; though he was hospitable to a fault, it was not to these qualities chiefly that he owed his position and his usefulness in the profession, but to a life devoted to its improvement and elevation. Considering his energy, his industry, his unselfishness, the worthiness of his aims, the work he has done, the influence of his example as an advocate of educational progress and reform in his profession,—an influence which will be felt for good through many years to come—the sudden termination of his earthly career is a calamity, not alone to his family and personal friends, not alone to the institution of which he was the recognized head, but to the practitioners of dentistry wherever located, and especially to American dentists. His place will be difficult to fill; perhaps not in this generation will it be in all respects completely filled.

The sad side of the history is that he allowed his interest in the school with which he was associated, and the general interests of the profession as an organized body, to make exhausting and damaging drafts upon him, involving the sacrifice of time, money, practice, ease, and pleasure. Had he brought the same ability, the same industry, the same energy, the same concentration, the same persistence to the accumulation of means by the practice of his profession, he might have left his family handsomely provided for. That he did not do so not only constitutes a cause of regret for their sakes, but calls for a substantial recognition of his valuable labors and services in the advancement of the dental profession in usefulness, self-respect, and public regard, and in strengthening fraternal courtesy and co-operation among its members.

Dr. McQuillen leaves a widow and four children, one of whom, Dr. Daniel Neall McQuillen, a graduate of the Philadelphia Dental College, has but recently engaged in practice. Mrs. McQuillen will receive the hearty sympathy of hundreds in the profession who have shared the hospitality of her home, and who will remember with what interest and kindness she received and ministered to her husband's friends.

The resolutions appended show the estimate in which Dr. McQuillen was held in his own city, and by his colleagues and pupils.

At a meeting of the dental profession, held at the Philadelphia Dental College, March 5, called with reference to the decease of Dr. John H. McQuillen, the following preamble and resolutions were adopted by a rising vote:

Whereas, Dr. J. H. McQuillen has been suddenly removed from among us by death, it becomes our privilege as well as our sad duty to make record of the event, and to express our estimate of his worth and our sense of the loss thus sustained; therefore,

Resolved, That Dr. McQuillen has been for many years so identified with the interests of the dental profession and so earnest in their advancement, so indefatigable in his efforts in behalf of the elevation of the standard of education, of graduation, and of practice, that his death leaves no one man who in all respects fills the place thus made vacant;

That while as an operator he was gifted with more than ordinary ability; while as a teacher he was conscientious and earnest, his labors in the organization of the profession and in promoting its educational interests gave him marked pre-eminence;

That, more ready to serve than to be served, more solicitous for the advancement of the profession with which he was identified than for personal advantage, he, indeed too often, ignored the latter in the effort to promote the former;

That a life devoted to the self-sacrificing service of his profession, and to the promotion of all plans having for their object its improvement, made him an example of concentration, of industry, and of persistent effort worthy of imitation;

That, while thus recording our appreciation of his professional attainments and labors, we desire also to express our affectionate remembrance of him as a genial, generous, sympathetic gentleman, and to tender to his bereaved family the assurance of our profound sympathy.

AT a special meeting of the Faculty of the Philadelphia Dental College, held on Wednesday, March 5, 1879, the following preamble and resolutions were offered, and, after appropriate remarks by members of the Faculty, were adopted:

Whereas, The sad intelligence has reached us of the sudden death of Dr. John H. McQuillen, practically the founder of this institution, and its Dean since its establishment, sixteen years ago; and,

Whereas, It is fitting that we should place on record a testimonial of our high appreciation of his ability, industry, untiring zeal, and steadfast consecration to the interests of this school; therefore,

Resolved, That to his organizing faculty, his earnest efforts, and to his unselfish devotion to its interests, the Philadelphia Dental College owes, to an extent not to be estimated, its successful career as an educational institution, and its high reputation both at home and abroad; trials, impediments, opposition—circumstances which operated as discouragements to others—only serving to stimulate him to fresh endeavor;

That in his death the dental profession has lost one who has done as much

perhaps as any one man to elevate the standard of dental education and practice in this city, in this country, and to no little extent throughout the world; his consecration to the furtherance of all efforts which in his judgment would advance the interests of the dental profession having so won the confidence of his brethren as to command their recognition of him as an able and trustworthy leader;

That, appreciating his talents, his attainments, his labors, his earnestness and his self-sacrificing spirit in all that concerned the interests of this school, we especially cherish the memory of his numerous manifestations of personal interest and kindly helpfulness;

That, with a copy of this expression of our appreciation, esteem, and affection, we tender to his widow and children our sincère sympathy.

AT a meeting of the Alumni Association of the Philadelphia Dental College, held March 5th, 1879, the following preamble and resolutions were adopted:

Whereas, We have received the painful intelligence of the decease of our beloved and honored professor, Dr. J. H. McQuillen; therefore,

Resolved, That in his death the Philadelphia Dental College has lost one who was ever ready to devote his time, talents, and best efforts to the promotion of its highest interests;

That the profession has lost an earnest worker in the cause of dental education —one to whose indomitable energy and perseverance the college was indebted for its success, in which every graduate and student feels a legitimate pride;

That a copy of these resolutions be forwarded to his bereaved family, with the expression of our sincere sorrow and sympathy.

At a meeting of the students of the Philadelphia Dental College Wednesday morning, March 5, 1879, the following resolutions were adopted:

Whereas, Our friend and beloved teacher, Dr. J. H. McQuillen, has been removed by death; it is hereby

Resolved, That we receive the intelligencc of his sudden decease with deep regret and heartfelt sorrow;

That in his death the Philadelphia Dental College loses a most able instructor, the dental profession an arduous and conscientious worker, and society a useful and honored member;

That a copy of these resolutions be sent to the family of the deceased with the assurance of our deep sympathy in their bereavement, also that a copy be furnished the *Dental Cosmos* and the city papers.

ANOTHER MEETING OF THE ALUMNI ASSOCIATION.

At a special meeting of the Alumni Association of the Philadelphia Dental College, a committee was appointed on resolutions,— and respectfully submitted the following:

It is our painful duty to record the death of our teacher and fellow member, Prof. J. H. McQuillen.

Resolved, That in his death the Alumni Association of the Philadelphia Dental College has lost a friend, who was ever ready to devote his time and talents to the best interests of our Alma Mater.

Resolved, That in his death the profession has lost an invaluable member and a most earnest worker, in the cause of Dental Education. To his indomitable energy and perseverance we bear our testimony,—and mourn his departure.

Resolved, That a copy of these resolutions be forwarded to his bereaved family,—and to the Dental Journals for publication.

DRS. A. BOICE.
" J. MCMANUS.
" A. TEES.
" L. A. FAUGHT.
" W. H. FUNDENBERG.
" J. L. EISENBREY.
} Committee.

CORRESPONDENCE.

BOMBAY, INDIA, January 7th, 1879.

Editor Missouri Dental Journal:

DEAR SIR:—Of the state of the dental profession in Asia, not much in its favor can be said. The natives knew nothing of dentistry before foreigners went among them, and even now they rarely resort to dental skill.

Dr. H. H. Winn, of the Ohio College, is located at Shanghai, well established in a good paying business, thoroughly up to the times, and is comfortably fixed. There are several itinerant members of the profession who honor Shanghai and other cities of Northern China with their presence occasionally. Dr. Eastlacke (also an American), the first dentist who went to China, after making one comfortable fortune, took a sojourn in America and Europe of eight years. But being unfortunate in his selection of bankers, was obliged to return to Hong Kong, where an excellent practice at good prices awaited him. Dr. Rogers also has an office in Hong Kong, where he practices part of the time. Chinese goldsmiths do all the mechanical work, and very clever are they at it too.

If they were allowed to witness operative clinics, and given the advantages of a dental education, they would undoubtedly make fine operators. But they are kept entirely in the back-ground, except where their services are absolutely required. The few who have had even these meager advantages, when they open offices on their own account, meet with fair success. In every other business and profession their presence has a very appreciable influence, with good results to their own people. In the streets, about temples, market places, etc., among gamblers, fortunetellers, and petty tradesmen, the charlatan is seen—strings of old teeth, a few old bottles with some dirty-looking decoctions, powders, salves, a pair of rude plyers, and a primitive elevator, constitute his complete cabinet. No attempt is made toward the filling of cavities, the removal of tartar, or the construction of a full denture. I have witnessed a number of those clinics among the other gazers of a street crowd. Teeth or roots are flirted out with an elevator, after having some pulverized soapstone placed around them for a few minutes. If an artificial one is to be substituted, he files one out of bone and ties it to adjoining teeth with a string. Of the mass of Chinese one sees in the streets, the teeth of the majority are not regular or well cared for, though they use the cheap brushes to be had at the stalls, quite generally. Tobacco chewing is not indulged in, though they smoke almost continually.

The Malays and Singhalise, of all ages and both sexes, chew betel-leaf, tobacco, aracanut and chunam all in one quid. This keeps their mouths stained red, though the teeth, when free from tartar, are white and beautiful, arches regular, articulations correct, and free from decay. Their diet is chiefly rice and the insipid fruits which grow abundantly everywhere.

The itinerant dentist holds high carnival among the foreigners in the Straits settlements, in Java and in Ceylon once in a while; though occasionally a native goldsmith or jeweller tries his hand. Madras boasts of an English dentist who has made a fortune, and lives in style, though his field is not exempt from visits from the itinerant. Neither of these was at home however during my visit to Madras.

The dentists of Calcutta are a sorry lot. A drug firm has brought out three English chemists' assistants at different times, who have seen a little dentistry done in the old-fashioned English way (new departure), with the understanding that if dentistry grew slack or

did not pay, they would make themselves useful as clerks. After their contract time expires they open out on their own account. One of them is reported to have a practice of three thousand rupees a month. He is also dental instructor in the Government College hospital. I witnessed two of his clinics. He made a great flourishment of instruments (such as are used as curiosities in America now). Extracting was, of course, the most frequent operation. The teeth of the natives have short roots, though the arches are full and regular; the deposit of tartar is very great. The other operations in which carbolic acid, mastic, cotton and amalgam were his main stays, were very amusing to behold. He had half a dozen students wrapping cotton mops on instruments to wipe out cavities with. Some were too small, some too large, some were wound with wrong twist, etc., and none cleansed the cavities dry. Although the lectures for the term had just closed (for which the professor was very sorry on my account), the simplest questions asked by their teacher to show off, were not correctly answered. Everything looked as though he had been teaching and showing them how *not to do it*, even according to his own standard of excellence. There are several native dentists who have received limited instructions in mechanical work in the laboratories of Europeans who are groping blindly in the dark with a few old castaway English instruments, donated by their former masters. Dr. Kearsig, said to be an American, tried practice in connection with another dentist at Calcutta for a while, but gave it up and went to Burmah, where from last accounts he had been appointed doctor to the king's harem. Medical colleges, dental branch excepted, do great credit to the government and to their managers, afford good clinical advantages, are kept in good order, and their instruction seems quite thorough.

Campbell Hospital (vernacular), an immense structure accommodating six hundred patients, is full all the time, but unfortunately the vitality of the majority of patients is so low when they enter that there is but little to build upon. Sixteen to twenty dead bodies are carried out every morning. As the laws are very favorable to the practical study of anatomy, the students are never at a loss for material. Cremation finishes what they leave. There are four hundred students attending lectures, clinics and dissections, in this institution, many of them smart looking and give promise of becom-

ing intelligent practitioners. The state of the dental profession in Central and Northern India is much the same, though a little better than at Calcutta. Itinerants enjoy good practices at fees ranging from five to sixteen rupees a sitting—seven hundred rupees for a double set of teeth; other work at fees ranging between those prices. The representatives at Bombay are better yet, though all complain that business is not what it used to be before the canal was made. Now people go home about once a year, and so cheaply that they only have what is absolutely necessary done at India prices. There is plenty of room, and there are absolutely needed through India and the East, about a dozen first-class American dentists, having complete American outfits, with means enough to furnish apartments in good style, plenty of good moral courage without alcohol, and capable of standing the climate. In other words, a thorough Christian gentleman would be highly appreciated and well rewarded by plenty of work at high prices. Female dentists would also do well in the families of the Maharajas or Indian princes. Yours truly,

WM. N. MORRISON.

ILLINOIS STATE DENTAL SOCIETY.

It has been found necessary for the executive committee of the Illinois State Dental Society to change the place of holding the next meeting from Peoria, the place selected at the last meeting, to Springfield.

The next meeting will, therefore, be held at Springfield, Ill., the second Tuesday, May 13, 1879. An urgent appeal is made to the dentists of the state, and a cordial invitation is extended to the profession of other states to meet with us. By order of the executive committee.

The fifteenth annual meeting of the Illinois State Dental Society will be held in the Hall of Representatives, at Springfield, Ill., beginning on Tuesday, May 13th, 1879.

All dentists in Illinois and neighboring states are invited to be present.

EDMUND NOYES, D. D. S.,
Secretary.

LOSS OF HAIR.

BY JOHN V. SHOEMAKER, A. M., M. D.

Hair is merely modified epithelial tissue enclosed in follicles and is found over almost the whole surface of the skin. It may be long, as on the scalp, short and thick, as on the eye-lashes, or soft and delicate, as over the greater part of the surface of the body. The length of the hair ranges from one line to one yard, and varies much in the two sexes and in different parts of the body. According to the accurate observations of Wilson, the thickness of the hair ranges between 1-1500 and 1-400 of an inch, being finer in children than in adults, and coarser in women than in men. As regards color, the hair may be either black, gray, white, light brown, dark brown, red, chestnut or flaxen. The hue will be modified according to the quantity of pigment present and the manner in which it is arranged in the fibrous part of the hair. The hair is lightest in northern climates and becomes darker as we pass southward. The hair acts as protection in both cold and warm climates. It is of service in assisting to maintain the temperature of certain parts of the body, and assists in eliminating some of the effete matters from the system. It is a means of defense for the eyes and the nostrils, and in certain occupations prevents the entrance of dust and dirt into the lungs. It likewise serves to adorn and beautify the features. Its loss, which is of frequent occurrence in young persons and in those in the middle period of life, is, therefore, not only a source of great inconvenience and distress, but also of great disfigurement. This important part of the economy seldom receives proper attention from either physician or patient. Patients should be made aware of the evil resulting from neglecting the hair, and physicians should understand thoroughly how to prevent its loss and, when such loss occurs, the proper manner of treating it and avoiding disfigurement, should be known.

The hair may fall out in patches or by general thinning, and it is to this latter class of cases that I shall briefly allude. The shedding of the hair by the atrophy of the tissues with the advance of age is preceded by general thining, but as it is a natural change, it should not be regarded as a disease, and will not, therefore, require any particular attention. Loss of hair, as a result of diseased action

occurs in both sexes, but most frequently in males. It may occur at any period of life, but is most common in young adults. It may concern the entire surface or only a portion. It usually, however, involves the scalp or the beard. When the disorder involves the head it usually begins about the vertex and extends until all the superior and anterior part of the head is bereft of hair. The hair may be shed rapidly, coming out especially during the act of combing or brushing; or it may fall out slowly and progressively, and this is the course in the majority of cases. In one variety of the disease, the scalp is to all appearances healthy, no crusts or scales being present. The hairs are dull, wanting in pigment, and when compared with the healthy hairs on the side and back of the head are found to have decreased in both length and thickness. These hairs are cast off from time to time, and are replaced by finer ones until the entire superior and anterior portions of the scalp are filled with very short and fine hairs. The disorder usually progresses for years without attracting the patient's attention until the loss is pointed out by some friend or acquaintance. If the diseased condition is not arrested, the small downy hairs will in turn be cast off until the crown of the head becomes permanently bald. In these cases the hair over the rest of the body usually goes on growing in the natural condition The patient, during the period of the shedding of the hair, will appear to be in good health, but a careful examination into the case will reveal the evident cause of this disorder. It will be found, as has been suggested by Von Barensprung, that this variety of the disease is due to a failure in the nerve power of the part. It occurs among those who are overworked, either mentally or physically. It is most liable to result from excessive mental strain, especially among professional men and men of active business duties. It is observed to result from unsuitable food, debilitating diseases, anxiety, grief, fast living, heat, neuralgia and rheumatism.

The next variety of general thinning of the hair occurs also upon the crown of the head. The scalp is covered with dry scales or crusts of various dimensions, or both may be present in the same case. Excessive cell proliferation takes place all along the course of the follicles. The small dry and white scales are loosely distributed over the different portions of the scalp. When the surface is closely examined with a magnifying glass the scales are found to

plug up all the open follicles. If this scurfy material is detached the surface of the scalp will present a gray and atrophied appearance. The hair is dry, withered, and lacks lustre. It is detached slowly and successively in combing, and even during the ordinary movements, until it becomes very thin or permanent baldness occurs. The crusts when present are firmly attached in the follicles, and when removed, will expose a red and unhealthy condition of the part. If the scalp is not properly cleansed in either case the accumulation of discharged sebum will alter and obliterate the follicles. This abnormal condition of the part will sometimes cause itching, and the scratching thus induced may cause eczema. This secondary change may mat the hair and crusts together and quickly kill the growth of the hair.

Those who are afflicted with this variety of the disease will generally have a lowered vitality, which will be expressed in cold extremities, dry and pale skin, or in some functional derangement. Syphilitic poison may give rise to an infiltration, or ulceration around the sebaceous glands and follicles, and so result in the loss of the hair. Ring-worm in children will often lead to destruction of the follicles and end in baldness of the affected part. Among other prominent causes are erysipelas, variola, lupus psoriasis, dyeing the hair, long-continued pressure on the scalp, and wearing coverings on the head that cause profuse sweating. Although the scalp is more abundantly supplied with hair in women than in men, owing to the hair being more scanty over the rest of the body and the superabundance of nutritive pabulum being carried to the head, yet the majority of women prevent the hair from growing in the proper manner. It is the incessant curling, crimping, and the injurious modes of dressing the hair that destroy its beautiful, soft and glossy appearance, and arrest its growth. It is also the bleaching and the powdering of the hair that render it dull, plug up the follicles and cause it to be cast off in handfuls.

If the hair received the proper attention, many cases of general thinning and premature baldness might be prevented. The use of close fitting hats and bonnets and the tension of the hair should be avoided. It should be exposed to the air every day as this wil assist in nourishing it. It should likewise be regularly cleansed by bathing with soap and water, as with the rest of the body, so as to wash off the effete material that exudes from the surface. It is im

possible to restore the hair lost by the natural changes of advanced years, or when the follicles are destroyed, or cicatrized; but if the follicles with their papillæ are healthy and no atrophy of the tissue has taken place, partial or complete restoration of the hair is possible, providing the remedies are properly employed. The majority of cases will require both internal and external treatment. Each case will demand special management, according to the causes of the disorder. For instance, syphilitic taints will require specifics; rheumatic and neuralgic conditions will call for anti-rheumatic and neuralgic remedies; unsuitable nutrition will demand good, substantial food; and crimping, powdering, bleaching and dyeing the hair will require an abandonment of the injurious habit.

With regard to those cases in which the patient is apparently in good health and is unconsciously losing the hair, tincture of ignatia, mercury, or sulphurous acid, have, in my experience, been the most successful remedies Some cases respond nicely to ten drop doses of tincture of ignatia, or one-half a drachm of sulphurous acid three times daily, with bitter tonics, while others show a more decided improvement upon very minute doses of mercury. Mercury, when given in very small doses, is a very decided tonic, and is especially valuable in the first variety of the disease as described above. The failure of the constitutional treatment to act promptly in many cases is owing to the manner of employing the medicine, and not to the use of any special remedy. For example, should mercury be given in the ordinary dose, or should it be persisted in for a long time, it will be found to pass off by the secretions and do very little towards benefiting the patient. If, on the contrary, mercury be administered for a short period in the amount of 1-15 to the 1-20 of a grain, of either the mild or corrosive chloride, and then the tincture of ignatia with a bitter tonic be substituted, and so vary the remedies from time to time, according to the patient's condition, the result will be either beneficial or successful.

The internal treatment should always be aided by appropriate external applications. In the first place, the head should be immersed in cold water every night and afterwards rubbed with a rough towel, until a warm glow is produced over the surface of the scalp. The head should likewise be thoroughly brushed from time to time until redness appears; and this brushing is especially serviceable in women. Active friction to the scalp, in order to awaken

the sluggish circulation, is indispensable, and the friction should be increased or diminished according to the insensibility or sensibility of the part. The short, ragged and lusterless hairs should be cut off at the ends, or plucked out. This will strengthen the hair and add tone and vigor to the scalp. It is also decidedly the best plan, when the long, healthy and normal hair has disappeared and the surface is covered with a fine, downy growth, to shave the scalp. This shaving should be repeated about every three or four weeks for some time, and should upon each occasion be succeeded by rubbing the skin effectually until every part is thoroughly stimulated.

In addition, occasionally passing a gentle current of electricity over the head will add very much in promoting the growth of the hair. It is of equal importance in the first variety to use some mild stimulating remedy that may assist materially the preceding practice. After washing the head I have used with success in these cases a lotion made as follows: Strong water of ammonia, one ounce and a half; spirits of rosemary and alcohol, each one ounce; tincture of capsium, two drachms; tincture of nux vomica, one drachm; spirits of chloroform, one drachm. This lotion should be applied with a sponge to the scalp three or four times a week. It should be rubbed in effectually until a warm glow is produced, and then the head should be bathed with warm water.

In the second variety, when the head is covered with the well-known dandruff, I usually wash off the scalp with medicated soap and water every two or three days. The soap that I prefer to use in such cases has been made at my suggestion by Mr. L. Wolff, of this city. It is composed of one and a half ounces each of oil of theobroma and olive oil; two drachms of German chamomile flowers; one drachm of precipitated sulphur, and one ounce of a weak solution of caustic soda. This soap removes all the dandruff from the head and produces a gentle stimulant and astringent effect upon the follicles and glands of the scalp. It will be necessary if the thinning or the loss of the hair is due to the formation of crusts, to remove them by oil dressings or poultices. The scalp can be saturated with oil, covered with a piece of old flannel and oil silk, and in from twelve to twenty-four hours the masses will be sufficiently soft to be easily removed. The parts can then be washed with the medicated soap and sponged from time to time with the lotion previously mentioned. All that remains to be done locally,

after stimulation in the first case, and the removal of the crusts and scales in the second, is to further induce the growth of the hair by the use of suitable liniments or pomades. I always prefer the use of oily preparations in place of cosmetics or pomades, as the latter are very liable to become rancid and do more harm than good. I have employed with advantage, to lubricate and induce the growth of the hair, the following liniment: Tannate of glycerine, two ounces; tincture of cantharides, one drachm; tincture of nux vomica, one drachm; oil of erigeron, two drachms; olive oil, one ounce and a half; oil of rose and oil of verbena, each five drops. This should be applied once every day until all the dull and lustreless hairs have disappeared, and there is some evidence of returning nutrition in the scalp and hair.—*Med. Bulletin.*

TUMOR OF THE LOWER JAW—THE SEAT OF VICARIOUS MENSTRUATION—REMOVAL OF ONE HALF OF THE BONE, FOLLOWED BY RAPID RECOVERY.

BY DONALD MACLEAN, M. D., PROFESSOR OF SURGERY, UNIVERSITY OF MICHIGAN.

Miss. E. C. aet. 16, from Assyria, Mich., was admitted to the University Hospital, on September 15, 1878, on account of a tumor of the lower jaw, which extended from the symphysis to the ear on the left side. The tumor caused marked deformity of the face and extended into the mouth, pushing the tongue over towards the opposite side. The surface of the growth within the mouth presented the appearance of a fleshy mass, somewhat livid and very vascular. A linear scar from a former operation could be observed at the front and along the lower edge of the tumor. The patient appeared to be in good health in all other respects, but she informed us that she had menstruated through the tumor for two years, and had never menstruated in any other way. She stated that the tumor was first noticed six years ago, when it was about the size of a hickory nut, and was situated about the center of the

alveolar margin of the jaw, *i. e.*, midway between the symphysis and the ramus.

She states that for four years the tumor grew very slowly, after which it began to increase rapidly. At that time iodine was applied externally, and, in the patient's opinion, did "a little good." In the spring of 1877 she had a tooth extracted, after which she thinks the tumor diminished in size. Afterwards it began to increase again, and iodine failed to do any good, although freely used.

In September, 1877, Dr. Young, of Nashville, removed the outer plate of the bone on the affected side and scraped away all the diseased structure, but the disease soon began to return and has continued to increase steadily till now. On the 28th of each month the menstrual flow has commenced from the surface of the mass which projects into the mouth, and the quantity has varied from half a pint to a pint each time. The tumor has never been painful.

The length of time that the disease had lasted, the patient's general excellent health, the fact that the tumor was confined to one-half of the bone, the absence of pain, all these facts induced me to recommend the operation of excision of the half of the jaw with the tumor, and justified me in giving the patient a very hopeful prognosis. (About six years ago I performed a very similar operation here for a young girl of about the same age, and with the most satisfactory results. When heard of, a short time ago, that patient was quite well and presented very slight traces of her operation.)

Chloroform having been administered, I made an incision from a little below the left ear along the base of the tumor to the centre of the lower lip and proceeded to dissect up the flap. At first the hœmorrhage, although not excessive, was very free, and several quite important branches spouted. Suddenly *all hœmorrhage ceased* and the patient became deadly pale and appeared to be in danger of dying from syncope.

The operation was stopped for a few moments and active efforts were made to revive the patient. Cold water was sprinkled on the face, the feet were raised, and the head lowered, and ammonia was administered by inhalation, and we very soon had the satisfaction of witnessing the disappearance of all the alarming symptoms. It

was thought safer to employ ether during the remainder of the operation, and as the anæsthesia produced by the ether was less profound than that by the chloroform, the patient did not lie as quiet as was desirable. Still no return of the alarming symptoms occurred and no further trouble was met with during the operation. The coronoid process was expanded into a broad trunctated cone, so that the division of the temporal muscle was more difficult than usual. Several large arteries required to be ligatured, but the internal maxillary was not wounded. One harelip suture was used for the lip and the remainder of the wound was closed by interrupted silk sutures. The contour of the face was preserved by filling the gap with lint. There was a good deal of shock, and the patient vomited coagulated blood, which had been swallowed during the operation.

On the evening of the operation the pulse was 160 and very weak, and the temperature 101½°.

Injections of brandy and hop tea were prescribed and had a good effect Next day the pulse was 120 and stronger; temperature, 100°. From this time the case made good progress, and on October 9, just one week from the day of operation, she walked into the amphitheatre without assistance. The stitches had all been removed and the wound was almost entirely healed. October 16 she was dismissed cured —*Michigan Medical News.*

March 9, 1879. The present condition of the subject of the operation above referred to, is worthy of note. Her general health is better than heretofore, with gradual improvement. The parts involved in the operation have entirely healed, with no indication of a return of the tumor, nor is there any discharge from the parts. The natural catamenial discharge has not been established, though every twenty-eight days there is pain characteristic of menstruation in the hypogastric region, with headache. If the uterus, and the associate organs, assume the normal function, doubtless all will be well; if this is not done, time only can determine the result.

This case has several points of especial interest to the dentist. It was an extensive and dangerous operation in oral surgery. It doubtless was much influenced, if not induced, by the teeth, or at least, by a tooth. The mass when removed weighed about one pound; it was somewhat larger, and nearly the shape of the egg of

a goose, and somewhat compressed in the direction of its shortest diameter. It was divided through its longest diameter, through the alveolus to the base of the jaw. This separation divided into nearly equal parts, a permanent molar tooth lying at about a right angle with its normal position; the masticating surface looking directly backward, the ends of the roots forward.

This tooth had never erupted, but was simply imbedded in the jaw; and the strong presumption is that it gave rise to this tumor, aided somewhat, doubtless, by the periodical discharges established at this point.

Numerous cases of tumors from impacted teeth are recorded, but I am not aware that any case has been given with all the peculiarities presented in this instance.—[*Ed. Dental Register.*

IMPAIRMENT OF VISION.

The impairment of eyesight by habitual protracted reading, has been made a special subject of study by M. Javel, a French physician, who also proposes a method of reducing to a minimum the damage so caused. In the first place, reading requires an absolutely permanent application of eyesight, resulting in a permanent tension of the organ. Secondly, books are printed in black on a white ground; the eye is thus in presence of the most absolute contrast which can be imagined. The third peculiarity lies in the arrangement of the characters in horizontal lines, over which we run our eyes. If, during reading, we maintain a perfect immobility of the book and head, the printed lines are applied successively to the same part of the retina, while the interspaces, more bright, also affect certain regions of the retina, always the same: the result is fatigue. Last and most important of all, in M. Javel's estimation, is the continual variation of the distance of the eye from the book. The accommodation of the eye to the page undergoes a distinct variation in proportion as the eye passes from the beginning to the end of each line; and this variation is all the greater in proportion to the nearness of the book to the eye and the length of the line. In order to avoid these injurious effects, M. Javel advises frequent intermissions during reading. To reduce the contrast between the white of the paper and the black of the characters, M. Javel recommends the adoption of a slightly yellow tint of paper. His third

suggestion is to give preference to small volumes which can be held in the hand, which obviates the necessity of the book being kept fixed in one place, and lessens the fatigue resulting from accidental images. Lastly, M. Javel advises the avoidance of too long lines, and therefore he prefers small volumes, and for the same reason those journals which are printed in narrow columns. Of course, every one knows that it is exceedingly injurious to read with insufficient light, or to use too small print.—*Pop. Sci. Monthly.*

[London Times, January 28th, 1879.]

PROGRESS OF DENTISTRY.

To the Editor of the Times.

Sir,—In the *Times* of yesterday Dr. Wedgwood comments upon the statement made by MM. David and Magitot, of Paris, upon the hopeful results of dental grafting, and says that, "in the operation of replanting teeth in cases of abscess and other dental lesions, he has been successful in 65 per cent.; whereas in transplantation —*i. e.* taking a sound tooth from one person to supply the deficiency of a diseased tooth in another—in the many cases that have come under his notice the results have been unsuccessful." "In one instance," he proceeds, "this operation culminated in the death of the patient through pyæmia." Permit me to say that replanting is rarely—very rarely—practised; when the operation is performed, it is invariably a failure. I doubt whether ten of these operations are performed in as many years, in America as well as in Europe. When the operation is had recourse to in cases of abscess, &c., preceded, of course, by the destruction of the *pulpa* or the heart of the tooth, the organ becomes almost a dead body, with greatly diminished vitality, and subject to innumerable evils which must result in the ultimate loss of the organ. In not one case out of a thousand will a qualified and experienced practitioner have recourse to replanting, but will confine himself to the legitimate mode of treatment in cases of abscess or other dental lesions. Whereas the operation of grafting or transplantation is of frequent occurrence in America, and in the majority of cases is successful, where the operator has a sound, healthy tooth to deal with. I speak from expe-

rience, having personally visited nearly all the dental infirmaries in the States, where frequent successful experiments are made. As to the case of death mentioned by your correspondent, I have, in the course of 15 years' practice, but once read of such an occurrence—in the Philadelphia Dental *Cosmos* of July, 1878. In that journal the case of a death through pyæmia, as described by Dr. Wedgwood, is mentioned.

Yours obediently,
J. MORDAUNT SIGISMUND, M. D., L. D. S.

48, Queen Anne street, Cavendish-square, Jan. 24.

CONVENTION OF AMERICAN MEDICAL COLLEGES.

At the meeting of the American "Medical College Association," held in Buffalo, N. Y., June, 1878, Prof. S. D. Gross, of Philadelphia, offered the following preamble and resolutions which were adopted:

"WHEREAS, It is eminently desirable that the medical schools of this country should adopt a uniform system of instruction of a grade fully in accord with the requirements of the age in other branches of study, and with the practice of the medical institutions of Europe; and,

"WHEREAS, All the efforts to bring about such a change on the part of the American Medical Association, of the Association of Medical Teachers, assembled at Cincinnati in 1867, and at Washington in 1869, and of different State medical societies, have signally failed; and,

"WHEREAS, The present time seems to be peculiarly favorable for taking strong ground upon the subject, inasmuch as it is now attracting general attention throughout the United States; therefore,

"*Resolved*, That this Association respectfully and earnestly request that the regularly organized and accredited medical schools of the United States hold at their earliest convenience a meeting for the purpose of adopting some definite and final action upon a subject of such vital importance to the dignity, character and usefulness of the profession and the welfare of the American people.

"*Resolved*, That in order to impart proper efficiency to this plan

each and every college be requested to send two delegates, consisting of one member of each Board of Trustees, and of one member of each Faculty, with full power to act for their respective institutions.

"*Resolved*, That the medical and secular press throughout the United States be respectfully requested to lend their aid in the dissemination and discussion of these preambles and resolutions in order to place the whole matter of medical education prominently before the profession and the people.

"*Resolved*, That a copy of these preambles and resolutions, signed by the President and Secretary of this Association, be transmitted to the officers of every regularly constituted medical college in the United States, with a request to hold the contemplated meeting as soon as possible."

In compliance with the action of the American Medical College Association, its Acting President, Prof. N. S. Davis, of Chicago, has designated *Atlanta, Ga.*, as the *place* of the proposed convention, and the *time* at 10 A. M. Friday, May 2d, 1879. (This is the Friday preceding the meeting of the American Medical Association.) It is earnestly hoped that delegates from all "regularly organized medical schools" in the United States will promptly meet at the above designated time and place. That the action of the convention may be definite, it is desired that each college send two delegates, with full power to act for their respective institutions—one of these delegates to be selected from the Board of Trustees and one from the faculty.

In general terms, the *object* of the convention is to adopt some "uniform system of instruction more in harmony with the requirements of the age." Among the questions appropriate for discussion and decision may be mentioned, "Shall all the colleges require attendance upon three regular courses of lectures during three separate years ere admitting students to become candidates for the degree of M. D.?"

Is any uniform system possible in this or other things? If so, to what extent is it possible or even desirable at the present time? Each doctor in the land doubtless has in mind an ideal medical college system. But this convention cannot act upon idealities; it can only act upon that which is practicable to all honest, efficient medical schools.

It is desired that those colleges which decide to attend the aforesaid convention by delegates, will send notice to that effect to the Secretary at any time previous to April 25th.

Signed, NATHAN S. DAVIS, M. D.,
Acting President of the American Medical College Association.
LEARTUS CONNER, M. D.,
Secretary, Detroit, Mich.

MISCELLANY.

THE ABSORPTION OF SUGAR.

The path by which sugar is absorbed has been investigated by v. Mering. No narcotics were used, since they all, including curara, have a tendency to induce the appearance of sugar in the urine. Mering made some preliminary experiments in which he was able to substantiate neither Dr. Pavy's statement, that muscular exertion and dyspnœa increased the quantity of sugar in the blood, nor the statement of Bernard, that sugar quickly disappeared from the blood. On the other hand, he corroborates Bernard's remark, that the blood contains more sugar after repeated venesection. The sugar appears to be chiefly contained in the serum, the blood-corpuscles containing very little. The serum of blood taken from the carotid contained in eight examinations, 0.115 to 0.235 per cent. Dogs were fed, after long fasting, on starch, and, after from two to six hours, killed, the stomach and small intestines ligatured and removed, and washed out with alcohol. The stomach contained unchanged starch, amidulin or soluble starch, dextrin, and erythrodextrin. The small intestine contained sugar and starch, but no dextrin, and small quantities of lactic acid. Examination of the amount of sugar in the chyle of flesh-fed, as compared with sugar-and-starch-fed, dogs showed no remarkable difference, so that there is no reason for thinking that sugar is taken up by the absorbents and transmitted through the thoracic duct. The examination of the venous blood led clearly to the result that the absorption of sugar is chiefly effected by the veins, the serum of the carotid and portal blood always containing a larger amount of sugar than normal.—*London Lancet.*

THE ABSORPTION OF ALBUMEN.

A. SCHMIDT-MULHEIM asks the question, whether digested albumen necessarily passes through the thoracic duct to enter the blood? To answer it he applied ligatures to the right and left thoracic ducts, and found the animals, if well fed, preserved all the appearance of sound health, and he noticed in particular that in dogs there was no diminution in the elimination of nitrogen. He describes in detail the changes in the lymphatic system resulting from the application of the ligature, the dilatation of the lymph and chyle vessels, the infiltration of the perivascular connective tissue, the extravasations of chyle in the cavities of the abdomen and thorax, and the enlargement of the mesenteric glands. With oleaginous chyle, he found that in almost every instance there were extensive infiltrations and extravasations, of a milky fluid, though there did not appear to be, as he convinced himself by mingling coloring matters with the chyle, any rupture of blood-vessels. In opposition to Sir Astley Cooper, who noticed rupture of the thoracic duct, and the escape of its entire contents, so that it was always empty and collapsed after ligature, Schmidt-Mulheim found it invariably tightly distended, and never injured. The general result of his experiments was to show clearly that after complete obstruction of the chyle and prevention of its entrance into the blood-circulation, the digestion, absorption, and metabolism of the albuminous compounds proceeded as usual.—*Ibid.*

Balata, a substitute for gutta percha, which it closely resembles, has recently attained importance in commerce. It is obtained from a tree that grows upon the banks of the Orinoco and the Amazon rivers of South America, after a manner similar to that of obtaining caoutchouc and gutta percha. The *Boston Journal of Chemistry*, in describing the characters of the substance, says, that though inferior to caoutchouc in extent of its uses, it has points of superiority over gutta percha. It gives an agreeable odor when warmed, is flexible and more elastic than gutta percha, may be joined piece to piece at a temperature of 120° Fahrenheit, but requires 270° for melting, a higher point than for gutta percha. It has various solvents, and will be valuable for insulating purposes.—*Buffalo Med. Jour.*

ON THE BEHAVIOR OF GLYCOGEN AFTER ITS INJECTION INTO THE CIRCULATION.

R. Böhm and F. A. Hoffman (*Archiv. für Exper. Pathol.*, etc., Band vii. p. 489) show that blood-stained urine was voided by a cat in the course of a few hours, after from 3 to 10 grammes of glycogen had been injected into the jugular vein. Glycogen is consequently one of the substances which cause a breaking up of the blood-corpuscles. The plane of polarization is rotated to the right by the urine, from which the albumen has been removed; it also reduces cupric oxide, though the reduction is five to ten times smaller than is indicated by the rotation. The substance causing the rotation can be isolated, by precipitation, with a large excess (6 to 8 volumes) of alcohol, at 95 per cent. The precipitate dissolves in water without opalescence, is not colored by iodine, and does not answer to Fehling's test; but it is entirely converted into grape-sugar by prolonged boiling with acids. The authors assume 194.3° as the average amount of rotation of the plane of polarization; whilst for an average of seven experiments with glycogen, the value was somewhat greater, 226.7°. The substance, therefore, which appears in the urine after the injection of glycogen, is achroo dextrin, not unchanged glycogen.—*Lond. Med. Record.*

NUMERATION OF BLOOD CORPUSCLES.

The numeration of blood corpuscles (a test of richness or poverty of the blood) has been simplified by a microscopic apparatus constructed by Prof. W. R. Gowers. In it tenths of a millemeter squares are ruled on the glass slide at the bottom of the cell. When the corpuscles have subsided to the bottom they are seen lying in the divisions, and the number in each can be counted, as in the method of Vierodt. In the French instrument, a little fluid had to be placed in the cell to secure the covering glass. To obviate this source of error, in Professor Gowers' apparatus the slide is placed on a metal slip, to which two springs are attached, which rest on the edges of the covering glass and keep it in position with a uniform pressure. The dilution employed is 1 to 200. Professor Gowers also adds the hint that it is not well to attempt to observe the character of the corpuscles during the numeration, but that this process should be kept distinct.—*Scientific American.*

URANINE.

This is the most recently discovered, and perhaps the most remarkable of all the coal tar or aniline group of coloring substances, now so extensively used for the adornment of the finest fabrics. Uranine is said by chemists to be the most highly fluorescent body known to science. Its coloring power is astonishing; a single grain will impart a marked color to nearly five hundred gallons of water.

A most interesting experiment, which anybody may try, consists in sprinkling a few atoms of uranine upon the surface of water in a glass tumbler. Each atom immediately sends down through the water what appears to be a bright green rootlet; and the tumbler looks as if it were crowded full of beautiful plants. The rootlets now begin to enlarge, spread and combine, until we have a mass of soft green-colored liquid. Viewed by transmitted light, the color changes to a bright golden or amber hue; while a combination of green and gold will be realized, according to the position in which the glass is held. For day or evening experiment nothing can be prettier than these trials of uranine, which are especially for the young folks. We are indebted for examples of the color to the editors of the *Scientific American*, who are sending out specimens free of charge to all their readers.

NEW CAUSTICS.

Two caustics, which promise to be most valuable, have recently been introduced to the notice of the medical profession by Dr. B. W. Richardson. They are sodium and potassium alcohols. When applied to the skin these alcohols are said to cause "gradual destruction of tissue, which may be so moderated as hardly to be perceptible, and may be so intensified as to act almost like a cutting instrument."

These caustics have the advantage that they will dissolve opium like ordinary alcohol, and also that their action can be stopped immediately by dropping on the eschar a little chloroform, which decomposes the caustic into chloride of the metal and triethylic ether, which is inert locally.

THE MEMBRANA TYMPANI.

This membrane is placed at the bottom of the external auditory meatus, separating the latter from the tympanum or drum of the ear; but, unlike the external auditory canal, it is not endowed with a high degree of sensibility, and foreign bodies coming in contact with it, give rise to a sensation of noise rather than that of pain. It seems to be merely a physical organ for the reception and transmission of the sonorous vibrations of the air, yet it is not placed in the most favorable position to perform this function, for though we find the more vertical the membrane, the more acute the perception and appreciation of sound, as in the skilled musician whose membrane is nearly vertical, yet, ordinarily in the adult, the membrane is placed at an angle of 45 degrees, and in the fœtus, it is nearly horizontal.

The membrana tympani is largely under the control of the tensor tympani muscle, which, when contracted, makes the membrane tense, and when paralyzed or inactive, the membrane, from its own resiliency, aided, perhaps, by the laxator tympani and stapedius muscles, assumes a relaxed position and is differently influenced by sound waves. Of all the phenomena of this membrane, those exhibited by it in a thoroughly relaxed condition, most often puzzle the student. When it is made tense, we cease to appreciate grave or very low sounds, but high pitched ones are better appreciated. This may be easily demonstrated by any one, as shown by Wollaston, of London. If, while the mouth and nose are closed, we attempt to breathe by forcibly expanding the chest walls, the air in the middle ear will become rarified, the membrane made tense, our appreciation of high pitched sounds increased, and of low ones diminished. Now, if we restore the normal pressure of air in the middle ear, as is readily done by swallowing, we shall find that we can appreciate low sounds as before. On the other hand, if this membrane is unusually relaxed, we cannot appreciate high-pitched sounds, but very low ones, which were before scarcely audible, now become quite distinct, and audition is often painful. It is not in our power to make this membrane relax at will, and we have to depend upon a pathological condition for observing the effect of relaxation. It is in facial palsy that we sometimes meet with this condition of the membrane, and it is probably due to an affection

of the small petrosal nerve given off by the facial during its passage through the aqueduct of Fallopius.

To understand the difference between the impressions made by sonorous undulations of the air upon a tense membrane and those received by one in a relaxed condition, we have only to apply the physical law that the more tense a membrane is the more numerous its vibrations, and the less tense the less numerous its vibrations. It is stated that when the membrane is brought to its highest degree of tension by voluntary contraction of the tensor tympani muscle, the limit of the appreciation of high tones may be raised from three thousand to five thousand vibrations per second. As high pitch and numerous vibrations go together, so a tense membrane which vibrates rapidly is in tune for high pitched sounds, while very low sounds are appreciated but imperfectly, or not at all. For a similar reason it is not hard to understand why a relaxed membrane which vibrates slowly is in tune for low sounds which are produced by slow vibrations, and out of tune for high pitched sounds which are produced by rapid vibrations.

Further, keeping these laws and principles in mind, can we explain why, in paralysis of the tensor tympani muscle which thoroughly relaxes the membrane, hearing should be painful? Bichat supposed that the tension of a membrane must be increased in order to increase the power of sound, but this is contrary to a law of physics, and Savart has shown that a tense membrane serves to diminish the effect of sound upon it (for it is evident a tense membrane will vibrate less full than a relaxed one), and thus certain disagreeable sounds will be softened.

A simple explanation is this: A relaxed membrane vibrates with more amplitude, its wave movements are larger, and impressions made by such a vibrating membrane upon the chain of bones, and finally upon the terminal filaments of the auditory nerve, are of such force and magnitude as to become painful to an organ whose function is to take cognizance of delicate impressions.

A NEW NERVE.

In a communication to the French Academy, Cyon claims that the eighth pair of cerebral nerves contain two nerves of entirely distinct senses—the auditory and the nerve of space ("Raumnerf"). He considers the latter the source of all our ideas of extension, and of the three dimensions of space.—*The Doctor.*

A REALLY INDELIBLE INK.

The ordinary so-called "indelible" inks are prepared from salts of silver, and the writing done with them can be removed by soaking the linen with a solution of cyanide of potassium (exceedingly poisonous, it should be remembered) or of hyposulphite of soda, or by moistening with a solution of bichloride of copper and then washing with aqua ammonia. A really indelible ink, that is, one that cannot be removed by chemical agents, may be made from aniline dyes according to the following recipe:

Take of aniline black 1 dram; hydrochloric acid 60 drops; alcohol 1½ drams. To be well rubbed up in a mortar; after which add a hot solution of 1½ drams of gum arabic in 6 oz. of water.

THYMOL.

The *Canada Lancet*, April 1878, states that this, the essential ingredient of oil of thyme, bids fair to entirely supersede carbolic acid as an external disinfectant—possessing, as it does, superior antiseptic properties, and being perfectly innocuous. It is prepared by treating oil of thyme with a strong alkaline solution, or by distilling the seeds of *Phycotis ajowan*, an East Indian plant. Solutions containing one part thymol to one thousand will completely arrest saccharine fermentation, and only small quantities are necessary to prevent decomposition. It is being used in Germany instead of carbolic acid in the applications of Lister's antiseptic dressings, with marked success. Its internal use has not answered the expectations formed of it.

TO PREVENT BOILS.

A very simple remedy is made known by Dr. Sieven, in a St. Petersburg journal, for preventing the development of boils. He states that if the skin be superficially scraped with a small knife, so that a drop or two of blood may be pressed through the epidermis as soon as the peculiar stabbing or pricking sensation and slight induration announce the commencement of the boil, it will not be further developed.

"EYE AND EAR INFIRMARY," OR "OCULIST AND AURIST," BY WAY OF ADVERTISEMENT.

The Medical Society of the State of New York, at the annual meeting held June 18, 1878, passed the following resolution. The subject being presented by the legal proceedings recently instituted in the Niagara County Medical Societies:

"*Resolved*, That it is a breach of the Code of Medical Ethics of this Society for a member of a County Society, entitled to send delegates to this Society, to use upon signs, bill-heads or advertisements, by way of advertising his profession, the words 'Eye and Ear Infirmary,' or 'Oculist and Aurist.'" *Buffalo Medical Journal.*

TO MAKE COW'S MILK MORE DIGESTIBLE.

In a German paper we note a hint given by Dr. Schaal witn reference to the taking of cow's milk by persons who have a weak stomach. He says he has always succeeded in avoiding any evil effects by eating a little salt on bread either before or after taking the milk. When he omits to do this, a single glass of milk will produce diarrhœa, whereas with salt he can take a whole litre.

EDITORIAL.

MOST of the dental colleges have closed their sessions, and have graduated about the usual number of students.

Through the colleges, two hundred or more graduates are annually entering the ranks of the profession. If *all* the new-comers were required to enter at the same door, we should in a few years reach a condition in which the holding of a degree would be a universal custom. Whenever this usage becomes nearly unanimous, the public will insist on its rigid enforcement in the case of the dentist, as uniformly as it does with the physician. All that can be done, either by the schools, the societies, or by individual effort, towards bringing about this most desirable state of affairs, is a point gained, and should be welcomed by the profession as a step taken in the right direction. On another page of this number will be found a call for a convention of American Medical Colleges, with a view to the adoption of some "uniform system of instruc-

tion more in harmony with the requirements of the age," than is that now in existence. That there is a necessity that dental colleges should convene for a similar purpose, cannot, we think, be doubted If a complete educational system cannot be agreed upon by the dental schools, there are no doubt certain points upon which they *can* agree, and thus inaugurate a certain degree of uniformity to which all the schools shall be bound.

A GOOD TIME IN BALTIMORE.—On the occasion of the Thirty-ninth Annual Commencement of the Baltimore College of Dental Surgery, and the Sixth of the Maryland Dental College, the two institutions were united under the charter of the former, and a new faculty was organized from the material of both schools. That this union will "be attended with far greater good to the profession and larger benefits to all," is undoubtedly true. The idea that the number of dental colleges now existing in this country should be diminished, is entertained by many thoughtful, considerate persons. But in a country so extensive as ours, a considerable number of schools seem to be required for the accomodation of the different sections of the country. Dental colleges will probably continue to exist East, West, North and South. Whether there exists a necessity for more than one college in the same section of country is quite another question. The experience of the Baltimore schools has produced the conviction that it was their duty to "combine and unite their efforts in the common cause." That they have acted upon this conviction, is creditable alike to all the parties directly concerned. Personal considerations and peculiar views, if any existed, have all been laid upon the altar of professional use. This is as it should be, and the act not only redounds to the credit of the membership of the faculties of both schools, but may reasonably be expected to result in an increased measure of success to the combined college.

A PLEASANT INCIDENT.—At the close of the commencement exercises of the Western College of Dental Surgeons, a handsomely engrossed copy of the following preamble and resolutions was presented to Prof. Sanborn, by the Dean of the faculty, accompanied by a few appropriate remarks.

Prof. Sanborn, although taken completely by surprise, responded in a brief but very felicitous manner.

At a meeting of both classes of the session of 1878-79, of the "Western College of Dental Surgeons," the following preamble and resolution were adopted:

Whereas, Prof. J. F. Sanborn has proven himself to be a gentleman of culture and education, a clear and entertaining lecturer, and a plain, practical demonstrator;

And Whereas, He has come many miles from his home in a sister State to lecture on a branch of our profession that is much neglected in Dental Colleges, namely, Mechanical Denistry;

Resolved, That the thanks of this class be extended to him for the material and incalculable aid he has afforded them by his lectures.

SENIOR CLASS.

JOHN H. SPALDING, President.
LOUIS OTTOFY, Vice-President.
WM. N. CONRAD, Secretary.

JUNIOR CLASS.

HENRY B. BULL, President.
LOUISE E. OTTOFY, Secretary.

BOOK NOTICES.

TREATMENT AND PREVENTION OF DECAY OF THE TEETH. By Robert Arthur, M. D., D. D. S. Second edition. J. B. Lippincott & Co., Philadelphia. Price, $1.25.

This is the second edition of the well-known work of Dr. Arthur on Prevention and Treatment of Caries of the Teeth. The method presented in this work is a modification of a system of treatment that is nearly as old as is dentistry itself. The modifications set forth by the author are such, however, as to constitute a very important improvement on the old method, inasmuch as it avoids that disfigurement of the teeth attendant upon it, and leaves the artificial separations in a form much more conducive to comfort and cleanliness.

Decay of the teeth has become so prevalent among all classes of people, that any suggestions looking towards an effectual mode of preventing, or of lessening its ravages, should receive the careful consideration of the profession and of the people.

Twenty years of attentive observation of the workings of this

system by so earnest and intelligent an operator as Dr. A. is known to be, should entitle his conclusions to great weight, and should commend the system he advocates to the careful examination of every practitioner. Let no one fail to read the work.

The Popular Science Monthly for April comes to us in advance of publication day, filled with the usual amount of useful and entertaining matter. This number contains a portrait of that distinguished scientist, Sir Humphey Davy, with a short sketch of his life; also New Guinea and its inhabitants, Health and Recreation, Early Traces of Man, Why do we Eat our Dinners? The Origin of Upland Lakes, etc., etc.

The Archives of Medicine, a new bi-monthly journal, the first number of which was issued in February, by Geo. P. Putnam's Sons, New York. Price, $3 a year.

The publishers are to be congratulated on the superior style in which this new journal makes its appearance. Paper and letter press are both of excellent quality, and the entire make up of the number is such as to greatly enhance the pleasure derived from reading the highly meritorious articles which it contains. It is difficult to say whether the matter or the manner of this new journal is entitled to the palm.

The original articles contained in this issue are as follows:

A New Method of Removing Interstitial and Submucous Fibroids of the Uterus, by T. Gaillard Thomas, M. D.; Provisional Report on the Effects of Quinine upon the Cerebral Circulation, by Mary Putnam Jacobi, M. D.; The Aid which Medical Diagnosis receives from Microscopy, by C. Heitzmann, M. D.; and Elementary Lessons in Electricity, by A. F. Delafeld, A. B.

Lectures on Physiology, by James T. Whittaker, A. M., M. D., Prof. of Physiology and Clinical Medicine, in the Medical College of Ohio. Robert Clarke & Co., Cincinnati. $1.75.

This volume is composed of a preliminary course of lectures in which the author treats of the Influence of Physiology upon Practice; the Conservation of Force; the Origin of Life, and the Evolution of its Forms.

"Where the sun does not enter, the doctor does," is an old Italian adage, based upon hygienic law.

RATES OF MORTALITY for the principal cities of the United States, or the year 1878.

	Rate per 1000 Inhabitants.
New York	23.42
Philadelphia	21.54
Brooklyn	25.50
Saint Louis	12.00
Chicago	17.83
Boston	20.10
San Francisco	16.14
Cincinnati	15.81

New Orleans and other Southern cities are omitted, in consequence of the epidemic which prevailed in that section last year.

VULCANITE SUITS.

BALTIMORE, March 8th, 1879.

FOR THE INFORMATION OF DENTISTS.

In the United States Circuit Court to-day, in Baltimore, his honor, Judge Bond, decided that it was not necessary for him to hear the evidence in the cases before him of the Goodyear Dental Vulcanite Co., against Dentists, inasmuch as the validity of the Cummings patent had been affirmed in this judicial district by his honor, Judge Giles.

He, therefore, granted the decree against the defendants' bill, answer and replication, without the reading of the evidence or brief of either complainants or defendants.

GOODYEAR DENTAL VULCANITE CO.

This company seems to be gaining all their suits. That against Preterre, of New York, and the "Brightwell case" at Baltimore are both against the dentists who make, or mend rubber plates, or use rubber attachments to metal plates. Besides these points, celluloid and rose pearl are held to be equivalents of rubber. What is the use of fighting longer? Let us take out our licenses, and acknowledge ourselves beaten. H. S. CHASE, D. D. S.

THE MISSOURI

DENTAL JOURNAL.

A Monthly Record of Dental Science and Art.

VOL. XI.—APRIL, 1879.—NO. 4.

RADICAL AND HEROIC TREATMENT OF ALVEOLAR ABSCESS.

[*Delivered before the students of Pennsylvania College of Dental Surgery, Philadelphia, Penn., November,* 1878.]

BY J. N. FARRAR, M. D., D. D. S., BROOKLYN, N. Y.

No. 1.

LADIES AND GENTLEMEN:

I come before you not entirely as a stranger but as one of you, one of the pupils of a former class in the Pennsylvania College of Dental Surgery. I come among you as a senior member to talk about a subject, which has for fifteen years interested me,—the treatment of alveolar abscess.

It is not intended to offer any especially new doctrine, for my customary practice is made up of methods that are old. If there be any difference between my habit of practice and that of others, it is not so much in kind as in degree, and more especially in making what is by most people a resort in emergencies, my common rule of practice. I am called a heroic operator. Perhaps this is true. I think it is if I can judge by what I see most others do, but gentlemen, this is no hobby of mine; I have no hobby. What may be said is not expected to meet with the approval of all. What

method—what custom—does? No matter where we look, in politics, religion or science, we find parties holding radically different views. It is well this is so for various reasons. So in dentistry he is wise who hears all sides, and then knowing all, knows where he stands, let his customary practice be what it may.

In the treatment of abscesses, our object should be to arrest the decomposition of living tissue, which in breaking down, evolves gas, leading to pain and greater destruction of surrounding living tissue. This process is one of the chief secrets of the origin of abscesses from dead pulps, the gas escaping through the foramen (sometimes accompanied with more or less dead matter), poisons the tissues about the apex of the roots. Any drug therefore, which will arrest or keep down this degenerating process, and evolution of gas, and at the same time stimulate the adjacent living tissues to a healthier tone is desirable. Of all medicines now known for simple chronic abscesses of ordinary size (unaccompanied with necrosis), it seems to me that creosote is equal to any, if not the best, because it has all of the desired antiseptic and stimulating virtues in a high degree. But although this is my favorite drug, there are cases of larger size where iodine or chloride of zinc, etc., is better, as will be shown in my next lecture.

While this method of practice may to some persons seem very radical and bold, yet it is a system by which I can obtain results that were not possible by the old method.

Rational, radical or heroic treatment of disease, consists in the use of the right medicine as a remedy in the right place at the right time, administered or applied in the right way and in the most direct manner.

While it is not my expectation to promulgate infallible ideas about diseases and their treatment, or, at this time, to advance any especially new operation, or introduce any new medicine; it may be profitable to glance carefully over the more advanced ground of modern theory and practice, with the view of inquiring into the rationale of the different features of the more prominent methods of dealing with diseases of the dental sockets, in the hope that if we do not gain many new ideas, we may at least become more familiar with methods, and especially the reasons for rational, "radical and heroic" treatment of alveolar abscess.

CLASSIFICATION.

It does not require very large experience in the "healing art," to lead one to believe that success of treatment depends much upon circumstances, and that some cases are more difficult to cure than others. There are often apparent irregularities, which upon reflection, are capable of classificatoin, and are reducible to forms or types.

This is no more true, however, with the physician than with the dentist, who in his daily routine of different cases finds that alveolar diseases are easily reducible to classes, depending upon duration of the disease before treatment, age and health of the patient, condition and quality of the tooth, periosteum, socket, and especially the stage or the degree of degeneracy of the apical portion of the root, when bathed in the contents of the cyst, which, in such cases, is almost invariably so much dead matter, and is liable to act as a foreign body. But, perhaps this may not be true of some very recent cases, which, although I am not positive, I believe like cases of whitlow, when cured early, may possibly, in some instances, be followed by a reunion of the periosteum with its former ossific associate. Especially does this seem possible in those rare cases of Alveolar abscess which are so situated about the root as not to involve the vitality of the pulp.

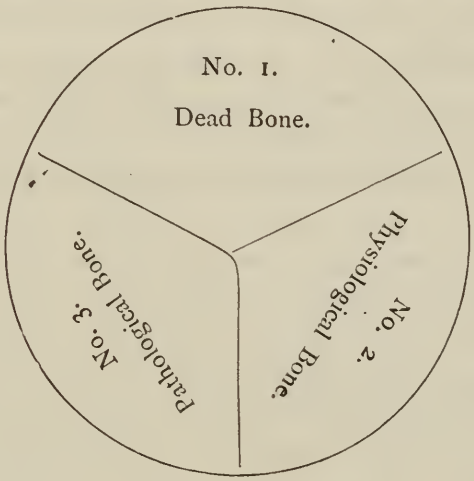
But, with such exceptions, the apical portion of the root involved, even after the abscess is cured, is dead matter.

This part of any tooth under such circumstances continues as a foreign substance, which is not only possibly liable to, but sometimes actually does, sooner or later, *even after the most skillful treatment*, take on further degeneration and disintegration, which then being an irritant, may be the nidus and cause of resurrection or reformation of the abscess, as in the case of an old soldier's encysted bullet, which, during some decline in the tone of his general health, may cause a re opening of an old wound that had been healed a long time.

As it is not the aim of this paper to enter into the histological causes of disease of the alveolar sockets and the teeth, but more to show my idea of some of the various means and methods of treatment and the reasons therefor, in a general way, and to show that *system* may be advantageous, we will pass over the primary

stages leading to abscess known under the terms pulpitis, periostitis, etc., and enter upon our subject at that point where actual disintegration of the tissues outside of the root exists.

Having in the *Cosmos* of July, August, September and October, 1878, dwelt upon medicines used in the treatment of alveolar abscess and necrosis in which not only may be found my opinions in regard to them, but the reasons theoretically and practically why some are better for the treatment of certain cases than others, and why certain medicines, although they may be best for one class of diseases, may be highly improper for another, we will confine our remarks now to the subject of the application of medicines with a view of ascertaining if it be possible to better establish a *system* founded upon sound principles.*



* Diagramatic showing of three divisions of the fields of experiments being made by Dr. J. N. Farrar, for the purpose of ascertaining the action of sulphuric acid upon bone, in order to the better understanding of the treatment of necrosis.

No. 1 illustrates the division of experiments upon three classes of dead bone, outside of the living organism, the results of which may be found in the *Dental Cosmos* for July, August and September, 1878.

No. 2 illustrates the division of vivisection experiments upon bone in a physiological condition, explained somewhat in the October No. of the *Dental Cosmos*, 1878.

No. 3 illustrates the division of experiments (as yet unfinished), upon bone in a pathological condition, as found in actual practice, but which will not be published until completed.

For convenience the subject will be treated under six heads:

Class 1.—Recent chronic abscess *with* fistula.

" 2.—Old chronic abscess *with* fistula.

" 3.—Acute abscess.

" 4.—Blind abscess, more or less chronic, without fistula.

" 5.—Antral complications with abscess.

" 6.—Apical ulcer or incipient abscess.

In the present lecture I shall confine myself to the 1st, 2d and 3d divisions. Alveolar abscess generally has a remote and a direct or immediate cause. As all probably know its first or remote cause may be inflammation, the result of blows upon or perhaps "improper wedging of the teeth," or colds; but oftener the cause is caries of the teeth. Sometimes there are other causes which are also themselves sometimes unassignable.

As before hinted, there are a few recorded cases of abscesses on teeth in which the nerve pulp was not involved, but continued healthy, and which appear to have had their seat of disease on the side of the roots or upon the apex of *one* root only of a molar tooth. The former instances, however, have been so infrequent that they will not be further considered, except as simple abscesses.

Whatever the remote causes may be, the immediate or direct cause of socket abscess, with the very few exceptions referred to, is generally the decomposition of the nerve pulp, root, or other foreign substance, pent up in the pulp-canal, causing, as a general rule, as a secondary step, degenerated hypertrophy, and congested thickening of the inter-osseal membrane, and usually of that portion of it which covers the apex of the root, and lines the corresponding portion of the socket (a condition of things somewhat resembling that which exists in the case of whitlow or felon), permitting formation of pus—detritus between it and its ossific attachment, which is increased in quantity by the addition of exudation from the degenerated membrane, and which forces it more and more, from the cementum, thus causing absorption or destruction of the cancellated socket-walls behind and around the sack, until, generally, if not opened by art, it extends in size sufficient to burst through the external plate of the alveolus or between the tooth and the socket, thus finding vent by nature's own drain tubes, through the gums.

FIG. 1. IDEAL DIAGRAM, SHOWING OUTLINES OF AN ALVEOLAR ABCESS ON THE ROOT OF A CENTRAL INCISOR TOOTH OF THE UPPER JAW.

a, Alveolar abcess.
b, Upper jaw bone.
c, Central tooth.
d, Gum and flesh of roof of mouth.
e, Fistula of abcess.
f, Dead nerve pulp.

There is now a cavity in the alveolar process, lined with thickened and diseased periosteal tissue, forming a cyst. The cyst is also lined with what the old writers called the pyogenic membrane (but which I believe to be no membrane, but simply a surface), within which there is pus and detritus, and into which is projected the apex of the dead root, generally more or less uneven, and sometimes indeed, ragged from decomposition. Upon the formation of the sac I shall further speak in my next lecture, under the head of blind abscess.

THEORY AND PRACTICE OF APPLICATION OF MEDICINE.

Having diagnosticated the case, our next endeavor must be to determine what to do with it. Passing over the consideration of those teeth that are so far degenerated as to be worthless, and which should be extracted because the degree of degeneracy of their roots renders a permanent cure impossible, we will begin with such teeth as can be made serviceable by curing the abscess.

In my opinion (contrary to that of some authorities), *our aim should not be to "destroy the cystic membrane," but to restore it to its former condition and position as nearly as possible.*

Now, hypertrophied, flabby, soft, and more or less paralyzed, the circulatory apparatus is irregularly enlarged, perhaps congested with stagnant blood; in places, degenerated even to decomposition; perhaps, permitting actual contact of pus with the socket-wall, which from the poisonous condition of this fluid, may

tend to necrosis. Under this state of things, our treatment should have in view the establishment of a sort of "line of demarkation" in the cystic tissues by the stimulation of all the cells, or tissue elements of the sacks and surroundings that are capable of restoration to a higher degree of vitality, and the killing and getting rid of those that are worthless. We should endeavor to contract the walls of the vessels to their proper size, dislodge stagnant blood, and re-establish freer circulation of better blood, thereby stimulating nutrition of the part, and changing the process of life from the downward, or disintegrating course, to a recuperative and healthier one.

[TO BE CONTINUED.]

EXCESSIVE HÆMORRHAGE AFTER TOOTH EXTRACTION.

BY PARSONS SHAW, D. D. S., MANCHESTER, ENGLAND.

Few dentists have escaped unpleasant and even dangerous cases of protracted bleeding after the removal of a tooth. A copious flow of blood will always follow this operation, but it ceases after a short time, in almost every instance, not again to be renewed. Sometimes, however, after an interval, the bleeding starts afresh and persistently continues, in rare instances terminating fatally. It is so general for excessive hæmorrhage to show no sign until some time after the patient has left the dentist, that quite too often not he, but a surgeon, is sent for, who, if he succeeds in arresting the bleeding, gets the credit of repairing the damage caused by the dentist; but if he fails from want of skill, this unfortunate person comes in for all the discredit of the catastrophe. This sort of thing will continue until the dentist becomes the complete master of all the situations that may arise in his practice.

The blood-vessels which are in immediate proximity to the teeth are of moderate size, and when they are ruptured the blood oozes out, and the fibrin and the red and white corpuscles separate to form the coagulum or clot, which for a time fills the cavity left by the extraction. This mass is a naturally-formed magma which mechanically arrests the flow of the blood sufficiently long to allow the arterial vessels to contract their ends and form the necessary

cicatrization, which permanently closes them. Why this process does not invariably take place is not clearly understood. It may be that an unusually large artery has been severed, and is so situated, that the clot is unable to withstand the ejecting force of the blood. Or it may be owing to undue arterial pressure from various causes as may be expected just before menstruation in a subject of full habit, or undue excitement, depression of the general tone, and so forth. On the other hand it may be that the vessels have lost their normal power of contraction, or the blood its ability to coagulate; so that from one or several causes combined the efforts of nature, so generally successful, may fail. Mr. Salter discards the idea of the discharge being from any considerable arterial trunk that may have been wounded, but ascribes it wholly to passive bleeding of the entire disrupted surface. Without doubt this accomplished writer is, in the main, correct; but it will not always be safe to rely upon this, for it leads to the assumption that the cause is constitutional, whereas these cases of undue hæmorrhage are almost always eccentricities not likely to be again repeated, which indicates some exceptional cause. It is true there are met, in rare instances, patients in whom there is, from some cause, a constitutional tendency to profuse bleeding when a wound has been opened; and to these Mr. Salter's remarks will apply.

The treatment which has been advocated for hæmorrhage after tooth-drawing is both local and general. The local treatment consists in applying mechanical pressure, and styptics, astringents, escharotics, caustics, and so forth. The general treatment is indicated by the administration of internal astringents. The latter may be of some service in certain cases; but the topical treatment is the one to be relied upon under all circumstances. The application of a plug is so obviously the basis of local treatment, that it has been universally recommended; and mechanical pressure alone will, in a majority of cases, perform all that is necessary. But it will sometimes fail, and the assistance of a chemical agent will become indispensable. These agents vary with almost every writer. Harris indicates tincture of nutgalls, a powerful astringent, in ordinary practice; and Tomes is sanguine matico, a milder astringent, is the proper agent. Of the two, matico is the most to be preferred, as being the less liable to do harm. Cauterization, spirits of turpentine and tanin have many advocates, while persulphate of iron, a powerful styptic, is a

great favorite with physicians and surgeons. The use of powerful chemical agents of any kind, and especially without pressure, is empirical in the highest degree, for they are not only ineffectual but are likely to increase the wound, as well as to cause much injury to the mouth and lips. In all sound treatment they will be altogether discarded. But anything which is mildly coagulant, combined with pressure, is a remedy containing the essential features of success. Such a remedy I have found in *alumen exsiccatum*, commonly called calcined and burnt, but which is really *dried* alum; for it is the ordinary alum of commerce heated in an earthen vessel until all the water is vaporized. This leaves a largely extended and highly porous mass not in the slightest degree altered, save by the loss of the water. This agent has been my whole dependence for hæmorrhage for nearly twenty years. Its action upon an excoriated surface is mildly astringent and styptic, and slightly escharotic; which indicates that it has the qualities, and in the mild proportions, which are required. But it is not upon these qualities that its success depends, although they are assistants in severe cases; for when skillfully applied, it forms the simplest and most perfect of all plugs. with the least pain and annoyance to the patient and allows us to closely follow in the process indicated by nature.

Having procured several pieces of the dried alum, about the size of a filbert, make no effort to clean out the cavity, for any coagulum which remains will assist rather than retard the success of the operation, and gently and slowly, but firmly, press one of these pieces into the cavity formed by the removal of the tooth. Gradually the oozing blood will enter the pores of the alum, forming thereby a tolerably firm and rather sticky mass which, as the pressure is continued is pressed into every part and against all sides of the cavity, forming the exact magma required. Other pieces must then follow until the cavity is completely full, no more blood appears, and the alum is quite dry on every part of its surface. A cloth may then be placed over the surface of the alum so as to keep it in its place. When the bleeding is found to have completely ceased, the cloth may be removed and the alum will remain a sufficient length of time to allow the necessary contraction of the arterial ends. If it is found, on examination, that blood still flows, renewed pieces of the agent must be again firmly—and if necessary, determinedly, pressed on the part from whence it proceeds. Sometimes

the hæmorrhage is so persistent and copious that a good deal of resolution and steady faith in his ultimate success is required on the part of the operator. The latter he will, I have no doubt, acquire after a few trials of the dried alum. After some time the alum will be dissolved. In no instance have I noticed the slightest apparent ill effects from the small quantity which must have passed into the stomach. Indeed, it is a remedy indicated for general treatment. Nor is there any undue irritation of the mucous membrane of the mouth; and the appearance of the alveolar cavity is satisfactory.

THE LITTLE HELPER.

BY J. G. HARPER, D. D. S., ST. LOUIS.

The little instrument I wish to describe has been a great help to me, and I hope that all who read these few lines may feel the same pleasure that I experience when using it.

To make the *helper* take a piece of hard wood a quarter of an inch in diameter and about an inch in length, cut in each end a groove parallel one to the other. You now have the assistant, but do not know its uses. One of the places where it will help you is in finishing proximal fillings in the front teeth, with slips of sand paper or lava-strips; the operator is greatly annoyed by the strips slipping off the end of the tooth; this can be prevented by the helper; after putting the strip between the teeth the helper is placed so that one end rests against the ends of the teeth, between which the sand paper has been placed, the cutting edges of the teeth occupying the groove; the other end is pressed against by the antagonizing teeth in the opposite jaw. Now take the ends of the slip between the thumb and fore finger of each hand and draw rapidly back and forth over the filling, cutting very rapidly until the filling is dressed down to the surface of the tooth, then turn the slip and let the back of the paper touch the filling; draw this a few times over the filling and you have a beautiful finish. Another place where the helper can be used, is when filling a tooth that is pained by the lateral blow of the mallet. Place the helper as described, and instruct the patient to keep the teeth pressed hard against the piece of wood. This holds the tooth firm and keeps it free from pain to the great satisfaction of both patient and operator.

IMPACTS, AND THE LAW THAT GOVERNS THEM.

BY W. H. ROBINSON, D. D. S., SUISUN, CAL.

The subtle little force that jumps from the mallet, strikes the plugger and makes the plugger strike the gold, we call an impact or blow. This impact may seem quite a simple manifestation of force, but it is an intricate manifestation—a result of many and causal factors

The immediate formators of a plug are materials and force intelligently applied. The part, one of these factors, force, plays in plug construction is my present theme. I have always recognized the importance of the materials, so much so, that when we hear the term "plug" or "filling," the impression or idea we receive from these terms is more of the material than of the manipulative force that forms them. We detract nothing from the importance of the materials in plug construction; we only want to emphasize the fact that the formative force that changes materials into plugs, is equally an important factor in that completeness that tends toward perfection.

One-fourth of an ounce of gold is material for a large plug, but it requires about one thousand pounds of force to change this material into a plug. Our completed plug is, then, a compound of one-fourth ounce of gold and one thousand pounds of force. This force is not a neutral factor.

Some years ago the force in plug construction was applied through an instrument held in the hand, and was termed "hand pressure." Now it is applied in various ways and by numerous machines, some very simple, others quite complex and intricate. The manner of their application of force differing mainly from hand pressure in the sudden impact by which the force is expended on the plug. The simplest applier of force by impaction is the common hand mallet. The impact of the hand mallet differs mainly from the impacts of the automatic, pneumatic, electric and other machines, in being more immediately under the control of the operator. He can put more intelligence into the impact of the hand mallet than into the impact of any yet devised machine mallet. Force, as derived from the impact of the hand mallet is very variable. In the early days of mallets, the various and diverse effects of the mallet impaction

on the plug, tooth and adjacent tissue led to much discussion on the relative merits of different mallets, such as light, heavy, soft, hard, etc. I think no one will dispute this proposition, that the same plugger, moving with a given velocity, will always impart the same impact, no matter what the instrument or mode by which the plug received its impetus. The application of this proposition must not lead us to suppose that the plugger itself, or the kind of motion under which it acts is not important.

The weight and motion of a plugger are the factors of its impact. Analyze these factors and we know just the kind of impact it will impart, *i. e.*, just the kind of impact it receives modified by its own weight.

The factors of an impact being the weight and velocity of the plugger, the elimination of these tells us the kind of impact. The weight of any given plugger being always the same, the character of the impact varies as the velocity.

Suppose we call the weight of a plugger two and its velocity ten, its quantity of motion or momentum would be twenty, and when made to impinge on a plug, it would impart just that quantity of motion (twenty) to the plug. Another plugger with a velocity of two, and weight ten, has the same momentum, and imparts the same quantity of motion to the plug it impacts. But the effect produced on the plug at point of contact is widely different. If we suppose the impact of the latter plugger just sufficient to weld foil number two, then the impact of the former plugger, having five times the penetrating force, would weld foil number ten, and the concussion or shock to the tooth and adjacent parts would be the same from both pluggers.

As to what kind of impactor is best for plug construction admits of a wide range of opinion, but I think all dentists will agree with me in this, that the impact that expends its major force directly on the gold, and imparts the least possible concussion or shock to the tooth and adjoining structures, is just the impact for plug, tooth, tissues and patient.

I admit that the sentient impressions of the patient and the observations of the operator are safe guides to follow, but until we comprehend, formulate and demonstrate the laws that govern mallet and plugger impaction as the rational deductions of these sensations and observations, we are groping our way in the shadowy land of empiricism.

Let me try some simple experiments and see what may be learned from them about the laws that govern impacts and impactors. I suspend from the ceiling of my laboratory a block of soft wood weighing about twenty-five pounds. I use a broad band or strap so as to allow free oscillation without torsion. I proceed to drive into the suspended wood a few dozen common brass pins, using mallets or hammers ranging in weight from one-fourth ounce to one pound. I soon learn that heavy hammers are not good to put pins into suspended wood. As I descend the scale I find the lighter hammers work better, and with hammers weighing from one-half ounce to three ounces I succeed; above this weight they oscillate the wood too much and bend the pins, while the very light hammers do neither, but bur or rivet the pin heads. I take a series of say ten mallets, varying in weight from one-half ounce to eight ounces. Through a hole in their handles near the end I suspend these mallets on a horizontal wire, and so adjust them that I can have them impact the wood, or any object I wish on the wood. On the wood I adjust a piece of thick lead plate, and against this a plugger, so it will move as easily as when held in the fingers. I know the weight of each mallet, and by measuring the distance I let it drop, I can ascertain the exact force of each blow. I assume as a unit of measure the force imparted by an impact from an ounce mallet let drop one foot, and call this an ounce blow. I now proceed to let each mallet drop one foot and strike the adjusted plugger against the lead on the suspended wood. I note the amount of oscillation the impact of each mallet produces; also, that there is a series of impressions in the lead, decreasing in the same ratio as the weight of the mallets. I now regulate the drop of each mallet so that the impact of each will give the wood the same oscillation. The mallets weigh respectively one-half and one, two, three, four, five, six, seven and eight ounces; and twenty-four, twelve, six, four, three, two and two-fifths, two, one and five-sevenths and one and one-half inches is the distance we let each drop, and represents its velocity. The weight of any given mallet into its velocity gives the momentum or quantity of motion, and now each mallet has a momentum of twelve.

If the mallets drop the distance given to each, and strike the adjusted plugger, each will impart the same quantity of motion to the wood, or cause it to oscillate the same distance. Now examine

carefully the impress the plugger made in the lead under the impact of each mallet. Here we learn a fact important to the dental student, viz., while the oscillation of the wood was the same under the impact of each mallet, the impress in the lead is different in each case. The heaviest mallet making the lightest, and the lightest mallet making an impress just sixteen times as deep as the heaviest. The weight into the velocity gives the momentum or oscillation of the wood, but to ascertain the impress on the lead we take the weight into the square of the velocity. In this calculation I have not considered the weight of the plugger. How does the weight of the plugger affect the impact?

Again carefully re-adjust the drop of the mallets so that the striking force of all is the same. The impact of each makes the same impression in the lead, but the wood oscillates four and a half times as much under the blow of the heavy as under the blow of the light mallet. I now use pluggers of various weights; first a two ounce one. When this receives an impact from a mallet of greater weight, it acquires the velocity of the striking mallet, and when the weight is less than that of the plugger, the velocity the plugger receives decreases as the weight of the mallet is lessened. I now find the lead receives the deepest impresses from the impact of the medium weight mallets, because the larger ones were moving with the lesser velocity, and the weight of the plugger neutralized the impacts of the light mallets. Remember it is the momentum of the mallet that moves the plugger, and in this last case the mallets all had the same striking force. If I had put a small lead shot on the head of each plugger, the impact of each mallet would have flattened the shot equally; but in doing this the large mallet would move the plugger twelve times as far, or give it twelve times as much momentum as the impact from the light mallet. I now substitute a plugger weighing one-eighth ounce, and make the mallets impact it with equal striking force, and under each impact the lead receives the same impress, but the oscillation of the wood increases with the weight of the mallets, being twelve times greater under the heaviest than under the lightest mallet. I omit from these calculations the weight of the light plugger.

I make another experiment of more practical utility to the dentist. I substitute for the lead on the wood, a gold plate, with surface prepared to cohere with foil, and upon this I proceed to weld some

foil, say Williams' number twenty. The impact wanted in plug construction is the lightest that will properly bring in play the cohesive property of the gold. I find an impact of from one-fourth to one-half the force of what I called an ounce blow does this; using a one ounce mallet and one eighth ounce plugger, the area of its point being equal to Varney's number two. An impact from the eight ounce mallet of the same striking force has the same welding force, but it oscillates the wood from eight to twelve times as much. I now try the welding power of the same impacts through a two ounce plugger. Through this the impact of the heavy mallet welds the gold, but it requires an impact from two to four times as forcible from the light mallet to weld gold through the heavy plugger as through the light one, and of course a corresponding increase in the oscillation of the wood or general concussion. I tabulate these results for comparison.

WEIGHT OF MALLET.	WEIGHT OF PLUGGER.	VELOCITY OF MALLET.	VELOCITY OF PLUGGER.	STRIKING OR WELDING FORCE.	OSCILLATION OR CONCUSSION FORCE.
1 ounce.	2 ounce.	4	2	8	4
1 "	⅛ "	4	3⅞	15½	3⅞
8 "	2 "	2	1½	18	12
8 "	⅛ "	2	2	32	16
½ "	⅛ "	16	16	32	2

I omit friction and intricate fractions, and assume perfect elasticity of pluggers and mallets. I do not claim absolute accuracy for these deductions, but an approximation that more thorough scientific research will confirm. The oscillation of the wood is a correct measure of the impact, also a correct measure of the concussion or jar the tooth and adjacent tissues receive in plug construction.

This concussion may not only be immediately painful to the patient and induce pathological conditions in the tooth and adjacent tissues, but concussion may, and often does, destroy the integrity of the plug itself. Take an ordinary molar after extraction, fill any ordinary shallow cavity in it carefully and thoroughly, using a light plugger and mallet, submit it to the severest leakage tests and it stands them. Now with mallet and plugger as heavy as some use, add some foil, or impact the plug for a minute or so as in ordinary

consolidation, apply the test and the plug, in many cases, leaks. If the tooth structure is strong and retaining points extensive, the plug passes the ordeal unscathed, but the concussion of heavy impactors is one serious cause of leakage. The concussion and rebound between the plug and dentos destroys that perfect union between gold and tooth that is proof against leakage.

I can not speak "ex cathedra" as to the best materials for mallets. Habit has some influence over all of us. The disagreeable noise of some is specially objectionable. Mallets of perfectly elastic materials impart their force to the plugger, and rebound instantly. Soft, inelastic mallets have no rebound. Elastic mallets give their full velocity to the plugger, but no weight. Inelastic mallets divide their velocity with the plugger and add their weight to it. The handle of the mallet is perhaps of more importance than the head. The short, stiff handle of the average dental depot mallet is an abomination. An impact from one of them has for its weight factor, mallet, handle and hand of operator, even when the operator holds ever so loosely to avoid hand weight.

Due proportions between heads and handles of all such tools as hammers and mallets is a fact carefully studied by the skillful workman. Take two mallets of equal weight, with handles ten inches long, one having the ordinary stiff, heavy handle, the other same size where held by hand, but made of whalebone or some very elastic material, and so small about two inches from the head that it springs and bends readily in ordinary usage. Now take a few old porcelain teeth and rivet down the pins, carefully noting the working of each hammer. We break fewer teeth with the limber handle. The rebound of hammers or mallets, as the case may be is different and so is the impact. The handles of all Dental mallets should be so limber as to spring readily in ordinary usage. Such woods as elm, hickory, etc., are good mallet material. They avoid the disagreeable noises of steel, ivory, etc., and have about the desirable degree of elasticity. To those accustomed to heavy pluggers and mallets, when first using light ones they seem to be doing but little effective execution; but if they experiment with both and accurately note results, they will soon be convinced that what they have got rid of, is not effective execution but noise and concussion.

The impact of all our automatic mallets has too much weight and too little velocity. Consequently, too much concussion. The

impacts of most of our Electric, Pneumatic and engine impactors have the same defects but not to the same extent; indeed some of these are tending toward a proper adjustment of the weight and velocity elements in their impact. The main objection to them is, their impacts are not directly under the control of the operator.

For that high type of manipulative execution that delicate operations on frail teeth require; trained muscle obeying intelligence, educated to the highest point of executive discernment, will always be the best motor; and the common hand mallet is now, and I think will continue to be the truest exponent of this motor.

I make a few practical deductions.

The best impact for dental operations is that which has the weight element at the lowest practicable point and the velocity element at the highest practicable point.

Pluggers should have the least weight, that will give strength sufficient to convey the impact from mallet to plug, or from one-eighth to one-fourth of an ounce.

The weight of mallets should be the least that will give sufficient impetus to the plugger; or from three-fourths to one and one-half ounces, and with handles so limber as to spring readily in ordinary use and from ten to twelve inches long.—*Dental Register.*

THE FOURTH STATE OF MATTER.

That the three states of matter, the solid, the liquid, and the gaseous, though widely different in their properties, are yet only so many stages in an unbroken chain of physical continuity, has been amply demonstrated. The solid passes into the liquid, the liquid into the gaseous form of matter, by insensible gradations; and there is nothing any more improbable in the supposition that these three states do not exhaust the possibilities of material condition, than in supposing the possibilities of sound to extend to aerial undulations to which our organs of hearing are insensible, or the possibilities of vision to ethereal undulations too rapid or too slow to affect our eyes as light.

Indeed, while Pictet and others have been converting into liquids and solids the most tenuous of gases, by successively shortening

the range of their molecular movements, Prof. Crookes has, on the other hand, succeeded in refining gases to a condition so ethereal as to reach a state of matter fairly describable as ultra-gaseous, and exhibiting an entirely novel set of properties.

The means by which this remarkable result was achieved were exhibited and described by Prof. Crookes at a meeting of the British Royal Society early last December; and the processes by which the discovery was made were discussed at length in a paper unfortunately too long even to be summarized here. It may be possible, however, to give an idea of their character and drift without the aid either of graphic illustrations or abstrusely scientific terms.

Our readers need not be told that the physical properties of gases are due to their molecular condition; in other words, to the swing and impact of their molecules, and the average length of flight of the molecules between collisions. As the number of molecules in a given space is reduced by mechanical exhaustion, the frequency of molecules' collision is of necessity reduced, and the mean molecular flight is correspondingly extended. Now it is obvious that if the tenuity of the gas is very greatly increased, as in the most perfect vacua attainable, the number of molecules may be so diminished that their collisions under favorable conditions may become so few, in comparison with the number of misses, that they will cease to have a determining effect upon the physical character of the matter under observation. In other words, the free flying molecules, if left to obey the laws of kinetic force without mutual interference, will cease to exhibit the properties characteristic of the gaseous state, and take on an entirely new set of properties. That this is a matter of fact, and not of theoretic speculation, is demonstrated by the researches of Prof. Crookes.

In his previous studies of molecular activity in connection with the radiometer, the molecules were set in motion by means of radiations producing heating effects. In the present series of experiments the molecular motion was determined or increased by the induced current from an induction coil. The investigation began by a study of the dark space which surrounds the negative pole when an induction spark is passed through rarefied gas. The width of this dark space was found to vary with the degree of exhaustion of the tube; with the kind of gas employed; with the temperature

of the negative pole; and in a slight degree with the intensity of the spark. For the study of these phenomena Prof. Crookes devised a very ingenious instrument, which he calls an electrical radiometer, and a variety of other apparatus, of wonderful delicacy and power, by means of which he was able to illuminate lines of molecular pressure; to converge streams of molecules upon a focus, with the evolution of light and heat and mechanical action; to deflect streams of molecules by means of magnets; to study the laws of magnetic deflection; to observe molecular shadows, so called, and other novel and extremely interesting phenomena.

The nature of the dark space around the negative pole Prof. Crookes interprets as follows: The thickness of the dark space is the measure of the mean length of the path between successive collisions of the molecules. The extra velocity with which the molecules rebound from the excited pole keeps back the more slowly-moving molecules which are advancing toward the pole. The fight occurs at the boundary of the dark space, where the luminous margin bears witness to the energy of the collisions of the molecules. When the exhaustion is sufficiently high for the mean length of the path between successive collisions to be greater than the distance between the electrode and the glass, the swiftly rebounding molecules spend their force, in part or in whole, on the sides of the vessel, and the production of light is the consequence of this sudden arrest of velocity. When streams of molecular discharge are focused upon a strip of platinum wire or foil, the metal becomes not only luminous, but highly heated by the severity of the bombardment; so, too, the molecular impact upon the side of the inclosing glass may be sufficient to make the spot too hot to be borne by the finger.

The limits of our space forbid any attempt to describe at length the phenomena of magnetic deflection or the ingenious apparatus by means of which the action of the magnet upon the trajectory of molecules was made visible. Under the influence of a magnet the behavior of a stream of molecules is likened to that of a stream of cannon balls under the influence of gravitation. In Prof. Crooke's words:

"Comparing the free molecules to cannon balls, the magnetic pull to the earth's gravitation, and the electrical excitation of the negative pole to the explosion of the powder in the gun, the tra-

jectory will be flat when no gravitation acts, and curved when under the influence of gravitation. It is also much curved when the balls pass through a dense resisting medium; it is less curved when the resisting medium gets rarer; and, as already shown, intensifying the induction spark, equivalent to increasing the charge of powder, gives greater initial velocity, and, therefore, flattens the trajectory. The parallelism is still closer when we compare the evolution of light seen when the shot strikes the target with the phosphorescence on the glass screen from molecular impacts." Applied to a stream of molecules the magnet twists the trajectory of the molecules round in a direction at an angle to their free path, and to a greater extent as they are nearer the magnet, the direction of the twist being that of the electric current passing round the electro-magnet. The two poles of the magnet, we may add, twist the stream in opposite directions.

Prof. Crookes, very improperly, we think, speaks of the stream of molecules thus brought under observation as rays of molecular light. True, light is evolved by their impact under suitable conditions; so it may be by the impact of a stream of cannon balls. The impact of the flying molecules raises the temperature of any body interposed to arrest their flight, just as the impact of a stream of cold cannon balls would heat a resisting body arresting their flight; but we cannot call the one stream a ray of light or heat any more properly than the other. With this reservation we may assent to Prof. Crookes' assertion that the phenomena he has investigated in his exhausted tubes reveal to physical science a new field for exploration, a new world—"a world wherein matter exists in a fourth state, where the corpuscular theory of light holds good, and where light does not always move in a straight line, but where we can never enter, and in which we must be content to observe and experiment from without."—*Scientific American.*

TREPHINING THE SUPERIOR MAXILLARY FOR REMOVAL OF A KNIFE BLADE.

[*Case from Dr. W. W. Dawson's Clinic at Good Samaritan Hospital, Cincinnati.*]

E. M., æt. 51, Indiana, married, minister. Has always been healthy. Present trouble commenced about one year ago last January, when he was struck in the face with a knife in the hands of a desperado, while holding service. The knife entered the cheek at a point about one inch to the outer side of the outer angle of the left eye. The blade was supposed to have been withdrawn by the assassin, or not to have entered the bone at all. A small lump appeared about the same time, situated in the roof of the mouth opposite the second molar tooth, on the same side as the external wound. The external wound healed by first intent, and no more was thought of it until about twelve months after this, when the lump in the roof of the mouth disappeared and a sharp point protruded.

Drs. Reagan, father and son, of Plainfield, Indiana, attempted to remove what was now for the first time suspected to be the knife blade of the assassin, but it was so firmly fixed that their efforts proved abortive.

Prof. Comingor was applied to, but in his efforts at extraction, about half an inch of the blade was broken off. After this the pain and rusty-colored expectoration continued. He then consulted Dr. Dawson for relief, and was sent to the Good Samaritan Hospital as his private patient on March 18th.

Present condition.—Man five feet eight inches in height, brown hair and eyes, in good condition, well nourished, appetite fair, bowels regular; teeth clean, tongue clean; small cicatrix on the left cheek about one inch to the outer side of outer angle of the eye. Small slit-like opening in the roof of the mouth opposite the second molar tooth; palpation over the superior maxillary and malar bones reveals nothing; physical examination negative.

Dr. Dawson said: Gentlemen, the inference is, that the remaining portion of this blade is in the malar and superior maxillary. It entered, as you see, the malar, passed obliquely downwards and inwards, crossing the antrum Highmore, and finally transfixed the

hard palate. We must remove it to relieve pain and prevent disease and degeneration of the bony structures in which it is imbedded. This may be done by trephining the superior maxillary, across the cavity of which we will doubtless find the foreign body.

The incision through the soft parts is such as we make for the removal of the infra-orbital nerve. This incision is commenced about at a point midway between the angle of the eye and ala of the nose, following the lower border of the malar around; end the incision just under the zygomatic process of the temporal; making a crescent-shaped incision.

Dr. Dawson then made the necessary steps; applying the trephine, he came upon something which proved to be the blade; elevating the bone he exposed its blunt end.

It was removed with considerable difficulty, being firmly fixed in the external and internal walls of the antrum. The blade was about one-eighth of an inch in thickness, and nearly two inches long. The bone around presented a somewhat rusty appearance, but did not seem to be diseased. The external wound was united with sutures, and thymol solution with a compress applied. Thymol solution being thymic acid, 1 gr. to 2 oz. of water (an efficient antiseptic).

8 P. M.—Patient *quiet*, has some pain; given 1-6 of grain of morphia hypodermically. Temperature 101½°. Pulse 98. 10 P. M., given 1-6 of grain of morphia.

March 19th.—Rested well. Has not so much pain, a rusty expectoration still continuing. Face somewhat swollen. Temperature 101½°. Pulse 98. 10 P. M.—Temperature 100¾°. Pulse 96.

March 20th.—Face swollen, rusty expectoration continued. Stitches removed as the incision was united. 8 A. M.—Temperature 100½°. Pulse 90. 10 P. M.—Patient quiet. Temperature 100½°. Pulse 98.

March 21st.—Swelling decreased, slight suppuration, rusty expectoration decreased. 8 A. M.—Temperature 101.

March 22d.—Swelling decreased, no redness. Temperature 100 Pulse 86. Discharged in company with his physician.

Dr. Dawson received, a few days ago, a letter from Dr. Reagan, from which the following is an abstract:

"I saw, a few days ago, a statement in the *Christian Advocate* that our patient, the preacher, died on the 4th inst.; and thinking

perhaps you might see said statement, I take the opportunity to say to you that it is entirely false. Instead of being dead, he is doing nicely. He was out in the country preaching yesterday."—[*Lancet and Clinic.*

ELEMENTARY LESSONS IN ELECTRICITY.

BY A. FLOYD DELAFIELD, A. B.

III. We have seen how, by rubbing two dissimilar substances together, a difference of electrical potential is produced between them. We tested this difference by holding one of them to a small body free to move, which was repelled as soon as it had acquired a charge of electricity by contact with the rubbed body.

The experiments I have described only show that glass and sealing wax when rubbed with silk have their potentials respectively raised or lowered. With more elaborate apparatus we can show that the silk has its potential correspondingly and equally lowered or raised. From what has preceded we know that:

1. A difference of potentials can be produced by friction of two dissimilar substances.

If we use in these experiments glass, hard rubber, sealing wax, sulphur, paper, flannel, silk, wool and other substances, we shall also find that:

2. It depends entirely on the nature of the substances rubbed together what difference of potentials is produced, and also which of the two substances will have its potential raised, and which lowered by the friction.

3. We can observe differences of potential in substances by touching them with light movable bodies, which then show attractions and repulsions.

IV. Let us now consider another method of developing electricity, namely: that of placing two substances in contact or in a liquid. It is supposed that any two substances under these circumstances will shew a difference of potentials; but only a few, namely the metals, carbon, some gases, and a small number of other substances shew enough difference to be observed by our most delicate instruments.

Even the greatest differences of potential obtained by this method

are far smaller than those produced by friction; so much smaller, that the pitch ball apparatus described above would not be affected by them. They are, however, observed by delicate instruments called electrometers.

In the most sensitive of these, called Thomsons' Quadrant Electrometer, a light rod or needle of metal is suspended horizontally by a fine wire over four pieces of brass, forming the four quadrants of a circle. The opposite quadrants are connected by wires, and adjacent ones insulated from each other. All four are insulated from the rest of the instrument, and the whole is covered with a glass shade. The suspended rod is kept at a high positive potential by an arrangement not necessary to describe here, and a small mirror is attached to it, which reflects on a screen a ray of light from a lamp, thus betraying the slightest movement of the rod.

With such and similar instruments we can observe that differences of potential are really produced by the mere contact of different substances. It is not necessary to detail these experiments here; it will be sufficient to show how the electrometer described is used to measure the differences of potential produced in ordinary galvanic batteries.

If we plunge a zinc and a copper plate in water, and connect them by wires with the pairs of quadrants in the electrometer, we shall find that the needle turns towards the quadrants connected with the zinc, and away from those connected with the copper plate.

We have thus evidently a difference of potentials between the poles of the battery, the potential of the zinc being lowered, and that of the copper raised. The behavior of the needle is precisely that of the pith balls described above. A pith ball of raised potential repelled one of raised potential and attracted one of lowered potential, and the needle of raised potential is repelled or attracted in the same way.

No difference can therefore be observed between the electricity developed by friction and that of the galvanic cell; a much greater electromotive force is produced by the friction than by the cell, but the same means can be and are employed to measure it in both cases.

If, instead of a single cell, we take several, connecting the zinc of one with the copper of the next, and the terminal plates with the quadrants of the electrometer, as before, we shall find that the electromotive force produced is proportional to the number of cells.

If for zinc and a copper plate we substitute different pairs of plates, such as zinc and platinum, zinc and silver, silver and copper, etc., we shall find that the difference of potentials produced depends entirely on the metals used, and that differences in the size of the pieces of metal employed make absolutely no difference in the electromotive force of the pair.

Varying the liquid in which the metals are plunged, it will be found that the nature of the liquid, if it be any of those used ordinarily in the construction of galvanic cells, affects very slightly the differences of potential of the metal pairs.

We have here then the same result as with the friction of dissimilar bodies, namely :

Electromotive Force depends on the nature of the substances employed to produce it, and not on their size.

V. So far we have only considered the production of differences of potential; we shall now discuss the means necessary to maintain such differences in such a way that, when the points of different potential are connected by a wire, a continuous current may flow from the point of higher potential to the other.

In attacking this problem, we may be sure at the outset that unless we expend continuous work we cannot keep up a continuous current; some apparatus must therefore be used by means of which work can be applied to this end.

The ordinary frictional machines are forms of such apparatus; the glass and silk or leather are so contrived that we can rub them together as long as we choose.

If we connect the prime conductor or metal cylinder which collects electricity from the glass with the rubber by means of a chain, a current will flow from the prime conductor to the rubber through the chain, and will continue to flow as long as the machine is worked.

To obtain a continuous current from a pair of metals in a liquid, we have recourse to the difference of the chemical action of the liquid on the two metals, and we choose the metals and liquid so that the liquid shall act strongly on one and not at all on the other. We can thus secure a great amount of work for our current—far greater than we can apply to this purpose by means of the frictional machine, where nearly all the work is wasted.

We must not forget, however, that the work thus applied, while

it strengthens the current, has absolutely nothing to do with the electromotive force produced in the apparatus; as we have already stated, this depends on the materials used.

VI. The production of currents by chemical means is accomplished by apparatus called Voltaic or Galvanic, after two scientists who discovered its original forms.

In practice several different combinations of metals and liquids are employed for the purpose ot producing electricity. The first combination used was one of copper, zinc and salt and water. Afterwards dilute sulphuric acid was used instead of the salt solution. It was found, however, that while a continuous current could be kept up by the action of these liquids on the zinc, the current was not constant; after it had passed for a time, its strength was much less. This is due to the fact that the liquid is decomposed by the action of the current, and the copper becomes covered with hydrogen.

The presence of gas on the copper not only prevents, mechanically, the contact of metal and liquid, but also acts just as would another battery opposed to the original one—the zinc-hydrogen pair having an electromotive force opposed to that of the zinc-copper pair.

The phenomenon of the metals of a battery becoming covered with gases, which produce an electromotive force contrary to that produced by the metals, is called polarization. The same term is applied to similar phenomena occurring in other cases.

To get rid of the polarization of batteries, Daniell separated the metals by placing one of them in a cup of porous earthenware, and then put a solution of sulphate of copper in the vessel occupied by the copper, while that occupied by the zinc contained as before diluted sulphuric acid. It was found that the hydrogen bubbles, instead of clinging to the copper plate, decomposed the sulphate of copper, the copper thus set free being deposited on the copper plates, while the sulphuric acid passed through the pores of the earthenware to the zinc, so that as long as any sulphate of copper was left, the action remained constant, or nearly so.

After this Grove invented a battery similar to Daniell's, replacing the copper by platinum and the sulphate of copper by nitric acid.

In this battery the nitric acid is reduced by the hydrogen set free, and fumes of nitrogen tetroxide escape.

Bunsen substituted carbon for the platinum in Grove's battery, leaving it otherwise the same.

Since then a mixture of potassium di-chromate, sulphuric acid and water has frequently been substituted for nitric acid in Bunsen's battery. By this means the fumes of nitrogen tetroxide are avoided, but otherwise the battery is inferior to Bunsen's, and it is going out of use.

In the Dipping batteries carbon and zinc are used without a porous cell intervening, and the liquid is the di-chromate mixture just mentioned.

In the Laclanche battery manganic dioxide replaces the nitric acid in Bunsen's battery, and chloride of ammonium solution the dilute sulphuric acid.

The form of battery most in use in this country is called the Gravity battery. It is constructed in various ways, one of which is as follows: A cylindrical glass jar is about three-quarters filled with a solution of zinc sulphate. In the bottom is placed a piece of copper, to which is fastened the end of a piece of insulated wire, and this wire is led up above the edge of the jar. Some lumps of copper sulphate are thrown on the copper plate, and then a piece of zinc is suspended in the jar, so that its under surface is about half way from the bottom of the jar. It is found that the difference in the specific gravities of the copper and zinc solutions is sufficient to keep them apart, and it is from its being so constructed as to take advantage of this fact that the cell has its name.

The Siemens-Halske battery is similar to the gravity battery, except that a diaphragm of papier-mache is used to still further ensure the separation of the two solutions.—*Archives of Med.*

NOTES ON AMYL NITRITE.

H. B. FELLOWS, M. D.

Professor of Diseases of the Nervous System in Hahnemann Medical College of Chicago.

EPISTAXIS.

A lady of about twenty-one years, a marked case of exophthalmic goitre, had nose bleed daily, often a number of times a day. The attacks were quite severe, and frequently quite prolonged—so much so as to produce much prostration. She had been under the care of several different physicians, some of whom were careful prescribers, but this symptom had so far resisted all efforts to control it. I

gave Amyl nitrite 2[x], and in a few days this obstinate symptom was completely relieved. The lady soon after left the city, but I was informed that the symptom remained substantially controlled. The use of the Amyl was suggested by the frequent flushing of the face. While under the influence of this remedy the patient did not get out of breath on ascending stairs to nearly the same degree as before.

NEURALGIA.

The patient, a lady of 35 years, had suffered for some days with a neuraliga of the right side of the head and face. The pain involved the right side at first, but under Bell. 200 went to the left side. The next morning it again attacked the right side. The eyeball was tender to pressure, and the eyelid drooped; it was impossible for the patient to open the eye to the natural extent. The pain extended to the vertex and was relieved by pressure there. Bell. did no good. Nitrite of Amyl was given by inhalation, a snuff or two taken from the uncorked vial. The patient remarked immediately after the first snuff that she could open her eye better. In a very short time the pain was cured.

NEURALGIA.

This case was also of the right side of the face, and also involving the head. It was brought on by exposure to cold. The patient wanted to cry all the time, she "could not help it." Various things had been tried for the pain, but nothing so far had produced more than a temporary relief. A few inhalations of this drug modified, and soon relieved the pain. The next morning the pain returned, but in a lighter form, and was easily controlled by the same means. There being other symptoms delevoped out of the cold, she received other remedies for them, but the relief of the neuralgia was no doubt due to Amyl nitrite.

CONGESTIVE HEADACHE.

This was a case of congestive headache, accompanied by ptosis palpebræ. In other attacks of this patient I had examined the eye with the ophthalmoscope and found it very markedly hyperæmic. There were, at times, hallucinations present. Bell. had usually brought relief, but previous experience with Amyl nitrite made me hope to bring more speedy relief. In this I was not disappointed. The patient took but a single breath of it, as she was somewhat startled by the penetrating odor of it, of which I had not

warned her. The relief from the pain was, however, complete and within two minutes.

The above cases illustrate its near relation to Belladonna. It is also closely related to Glonoine. A headache that I experienced after giving Amyl nitrite in a case of angina pectoris—where constant return of the pain in the case caused me to give it by inhalation at times for over two hours, and of necessity to inhale more or less myself—reminded me of another headache that I had after taking a drop of Glonoine 1x. I have never wanted to repeat this experiment. The hyperæmia of the brain, which Amyl causes, is not always accompanied by pain, but only by a sense of fullness and pressure. The sleeplessness, and imperfect sleep filled with anxious thoughts, give promise of a good remedy for those brain workers who so often over use their brains, and bring on insomnia. It corresponds very closely, in its action, to the insomnia which is one of the earliest symptoms of their breakdown.—[*Medical Counselor.*

NOTES OF SOCIETY PROCEEDINGS.

TREATMENT OF THE DECIDUOUS TEETH.

ST. LOUIS DENTAL SOCIETY, APRIL 8, 1878.

Gentlemen, of the St. Louis Dental Society:

If the subject allotted to me this evening is not the most important in the study of dental science, it is worthy of careful and earnest consideration. Experience shows that among our more enlightened patrons, these teeth are the objects of a lively interest, and are becoming more and more so every day. Certainly a subject which holds such vital interests as health, and indeed, human life, in its embrace, seems sufficiently significant to enlist our thoughtful attention. Passing over the histological features of this subject (which have been so ably presented to you in at least two previous papers), my province begins with the first appearance of the teeth. Although it may not be out of place to offer a few suggestions upon a subject which certainly has a very important bearing upon the one under consideration, viz.: The proper nourishment of

infants from birth. Indeed, one might go farther back, even into fœtal life, and indicate a regimen for the expectant mother. That the fœtus is influenced by the character of nourishment which the mother receives, together with her general surroundings, I think, will be admitted. It follows, then, that the teeth which figure so early and prominently in the osseous laboratory of nature share these conditions (good or bad), as the case may be. Hence the propriety of a carefully regulated diet for the mother that is to be; with an abundance of sunshine, not only in her apartments, but in her heart. With these conditions fulfilled to the best advantage, we start with the birth of the child. The diet of the woman during the period of gestation should be generous and wholsome, sufficiently varied to answer the fickleness of desire, which almost always obtains at such a time. Especially such food as is rich in the phosphates should be supplied. Unbolted flour of the different grains, milk, butter (as the least objectionable of the fats), and an abundance of fruit, either cooked or raw. Pears, grapes and dates being specially recommended. Add to this, daily exercise in the open air; walking, when the weather will permit; occupying, if possible, sunny and cheerful apartments; freedom from mental anxieties about household affairs, or friends; heart and hands occupied with some engaging pursuit; sensible notions as to dress; and we shall most likely see, in due time, a human being through whose whole life will be manifest the fruit of this thoughtful regard of the most important consideration possible to bestow upon the most important subject to *humanity*, viz.: *Physical structure.*

Nothing can excel a *healthy* breast in supplying proper nourishment for an infant. The mother or wet nurse should be perfectly free from constitutional taint, or as nearly so as possible; and unless these conditions obtain it would be better to rely on a good article of condensed milk, or other pure milk from *one* cow or goat. The nurse should have good teeth, a healthy mouth, kept scrupulously clean, that no impure exhalations should come in contact with the child.

With these conditions secured, we may have the assurance of a favorable dentition and await the eruption of each tiny pearl without fear of unusual physical or mental disturbance.

To the inexperienced eye of the parent and nurse there is present upon the alveolar ridge of infants the apparent incoming tooth months before it should be expected, and when the child is

worrisome (and very likely from deeply seated dental irritation), the lance is brought into requisition as a *soothing* application. Dentists know how *futile* and *unnecessary* this treatment is : but, I am sorry to say it, there are many physicians whose practice is no more intelligent than that of the parent and nurse. These repeated scarifications result in a mass of cicatricial tissue, which makes final eruption of the teeth much more tedious and painful. There seems to be a diversity of opinion among the profession upon the subject of lancing the gums of infants, some insisting that it does no good, but on the contrary positive harm at all times; others again insisting on cutting them right and left whenever there is any irritation. It seems to me there is a middle ground and a much more rational one. If it were true that every child came into the world under the most favorable circumstances, and was nourished according to the best of known conditions, the case would be different, and the necessity of interference with dentition would be the exception. Such is not the case, however, and we *can* by the exercise of judgment relieve many a little sufferer.

Instead of superficial scarification I recommend painting the gums with a dilute solution of aconite and iodine; never resorting to the lance until the tooth is so far advanced as to displace the divided gum tissue. In lancing the gum over an incisor or cuspid tooth, the cut should be crucial in form, over a molar a double transverse cut; thus preventing the wound from closing, which would defeat the end sought.

After the eruption of the teeth there should be nothing done but to keep them perfectly clean and free from irritating and corroding substances. I claim if a child inherits a good constitution, and is properly nourished thereafter, and the teeth kept clean, there will rarely come the necessity of filling children's teeth. One point of special importance to us is to impress upon the minds of parents the necessity for their co-operation, not only in bringing their children frequently before us, but in being earnestly in sympathy with us in the estimate of value placed upon these organs; for are they not to the *child*-life fully as important as are the permanent teeth to the adult life! If a thorough and perfect digestion in the adult is secured only by a thorough mastication of food, how much more important it is that the child with no comprehension of these principles should have a perfect denture, and be taught how to use it

There is too much bolting of food done by young and old in this age of rapid transit; but with a perfect denture there is no excuse for it. It is more or less a necessity with an *imperfect* one.

Now, then, with the teeth erupted and committed to our care, how shall we secure the best results?

1st. By cleanliness.

2d. By an early presentation of the patient to the dentists; not later than two years of age. Earlier is frequently necessary.

3d. Frequent examinations; certainly every three or four months.

4th. Removal of all disintegrated tissue where teeth are in contact, as preferable to filling.

5th. Filling grinding surfaces of molars at the earliest practicable moment.

1st. Probably nothing surpasses a rightly selected brush as one of the principal means of cleaning the teeth; though, for very young children, a bit of soft linen may answer a good purpose. I prefer a brush suited to the age of the patient, and the conditions to be overcome. Precipitated chalk, in a majority of cases, will be a sufficient dentifrice. A trace of fine soap may be used with profit. Both will neutralize any acid condition of the mouth. Brushing the teeth cannot be entrusted to the child under ten years of age; frequently not then. It may be well to offer an inducement to the child to brush the teeth by providing a detergent or saponaceous mouth wash that will be agreeable to the individual taste.

2d. Children should be frequently brought to the family dentist, it not being at all wise to depend upon the watchfulness of the parent or nurse, for upon professional supervision depends the *future* of their teeth. They should not be allowed to progress into an advanced stage of decay upon any surface, especially the approximating ones. We know how relatively large the pulps are in the deciduous teeth, and, consequently, how very thin is the tooth tissue covering them, not infrequently becoming exposed by caries at an insufficient depth to properly anchor a filling. From caries upon the approximal surfaces, then, must we look for the great proportion of trouble, from the fact that fibrous food is forced between these teeth and allowed to remain there until, in the course of time, the ruin is wrought. Fully appreciating this fact, we may, with proper treatment, save great discomfort to the child, and, at the same time, assist in preserving the teeth through the allotted period of their usefulness, which, to my mind, is very important.

Considerable tact and judgment may be shown by the dentist upon the occasion of the first visit of a little patient for professional service. Instead of a brisk, hasty or overawing manner, with no effort to come in nearer contact with the child than *looking down* upon it, while yet conversing with the parent; a sudden start toward the dental chair (a formidable looking object, unlike any other seat it ever beheld), as though not a moment was to be lost; the little imagination wrought up to the highest pitch, having probably been previously held on the gridiron of mental torture at home, as to what the dentist *wouldn't* do, by way of *hurting*:--I say, instead of this negative way of treating a child, let there be some condescension to the little ones; receive them cordially with proffered hand and suitable salutation. Make them feel that they have found a friend, chatting cheerily about things that interest all children, making at first no reference to the real business in view. When the proper time arrives, do this as a sympathizing friend, gaining (if possible) their confidence that you are able to relieve them. Overcome their timidity by giving them a ride up and down in the dental chair, and in a word, keep their minds occupied with any pleasant thing, which shall be foreign to their dental troubles. These little preliminary pleasantries may take a few minutes of valuable time, but of how much greater value is the regard, that not only the child, but the parent will have for you, and how much time it will really save of disagreeable coaxing and waiting to gain their submission to future needful operations. Never rehearse before the child to the parent, what you find necessary to be done, and *above all*, do not *deceive* in the *least degree* your little patient. Do not insist on prolonging an operation when the child has become weary and impatient, or in tears. Medicate and make another appointment, remembering the maxim, "He who walks runs."

Passing over the question of the effect on the osseous surroundings of premature extraction of the deciduous teeth, we believe it better that these teeth should be kept sound if possible, with living pulps to the latest day of their expected existence; that the physiological process of absorption, or taking down and removing the roots at the proper time may not be impeded by any untoward influence.

That dead and ulcerating teeth do exert a baleful influence upon the advancing permanent teeth does not admit of a doubt.

The treatment I have adopted in my practice is to *separate* the

molars especially, and indeed, any others which show the least indication of caries. I use, where practicable, the beveled disks. They do the work rapidly and efficiently. The angle of separation should be *obtuse*, this form being most economical of tooth tissue, and better serving the purpose of preventing the lodgment, and facilitating the removal of food. I have a set of home-made "*hard bits*," which I find valuable for special cases, enabling me to remove any sharp angles better than with the disks. These instruments are valuable a little farther on in the labor of protecting the permanent teeth from contiguous caries of the deciduous ones, by cutting away the latter without harm to the former. I find them well adapted to trim perfectly the conical margins of deep-seated fillings without injury to the soft tissues. This method of treatment of the deciduous teeth, gives me great satisfaction as compared with that of filling. Much disagreeable labor and valuable time are saved to the dentist, and much expense to the patient, and a far better result is obtained.

The approximate surfaces then being the most vulnerable point of attack, should be especially watched; this destructive tendency arrested, by the treatment I have suggested; and we have little to fear from caries in children's teeth.

True; the grinding surfaces are far from exempt, but are easily cared for. Filling with the different plastic materials should be done at the earliest practicable moment. Amalgam, in my opinion, stands *first* in the scale of value, by reason of its ready introduction, and permanency. Yet the dental porcelain, of recent introduction to the profession, promises much as a ready and desirable material. The preparations of *zinc*, which so rapidly become disintegrated, also, gutta percha, or Hill's stopping, are open to no objection (unless of non-endurance), where they can be judiciously used.

So far we have considered only incipient caries, on the approximal surfaces, which may be removed, and small cavities upon the grinding surfaces, which may be readily filled.

We come now to the most difficult class of all, both to the dentist and patient, viz.: deep seated caries upon the approximal surfaces of molars of very young children, four to five years of age, pulps exposed, aching, frequently *dead*, about taking on the ulcerating phases or having already done so.

That some pulps, in deciduous teeth, may be capped successfully, I am prepared to believe; but that we can take such liberty with anything like the proportion we do of adult teeth, I doubt. I really think only a small minority amenable to such treatment. I have satisfactorily treated cases like this—deep seated caries, which, if entirely removed, would uncover the pulp—have left intact this covering, and treated to a tepid bath of bi-carbonate of soda; medicated with wood creosote; and filled with dental porcelain in part or entirely. I should certainly make the cap filling of dental porcelain, as that does not irritate like the *ox-chlorides* of zinc.

"Weston's Convex Caps" are admirable for the protection of pulps. They may be used with or without a sub-filling. I think quite as good results may be obtained *without* as with. They can be quickly put in position, and the filling proceeded with at once. *Time*, with these young subjects, is a prime factor.

Children are frequently brought to us with a painful tooth. Examination reveals more or less caries, with a dead pulp—under pressure—with no adequate escape for the confined gas. Relief is undoubtedly obtained by giving it vent freely, and removing the dead tissue, if possible. Cleanse it out with tepid water, and disinfect with alcohol, medicate for a few days with creosote, fill the root with *thinly* mixed oxychloride of zinc, crown with amalgam or dental porcelain, or Hill's Stopping. I prefer the oxychloride for its antiseptic properties, and the facility with which it can be introduced, especially in the inferior teeth, a *few* fibers of *cotton* will aid its introduction to the superior roots.

There are other points which are vital in the discharge of our full duty to our little patients, the consideration of which would consume too much of your time, and I am admonished that a paper is but an introduction at best of the subject to be discussed. Hoping in this humble reference to my own endeavors to discharge what I believe to be my duty to my patients, I may have touched upon points which we all recognize as objective ones, and that some good may follow from an interchange of views, I submit the question.

DISCUSSION.

Dr. SPALDING thought no harm would result from the well directed use of the lancet in aid of the eruption of the deciduous teeth. Had used it freely for many years, and does not recall a single case fol-

lowed by unfavorable results. In the case of incisors, the lancet should meet the cutting edge of the tooth operated on. To ensure this with the lower incisors, he held the gum firmly between the thumb and finger of the left hand. If the tooth is pretty well advanced, the gum does not heal. But if union does take place, he does not think the formation of cicatricial tissue objectionable. Believes that such tissue will be absorbed quite as readily as normal tissue.

Dr. FORBES spoke of another point contained in the paper read, viz., the excision of a portion of a tooth for the prevention of decay.

He does favor the practice.

Dr. PARK earnesrly advocated the practice, especially as applied to deciduous teeth. When these teeth are badly decayed he practices entire excision of the crown, but holds it to be of the very first importance, that the roots of these teeth be retained until their successors are ready to take their places. When the entire crown is removed, filling the roots is usually not required. Uses arsenic for the devitalization of the pulps of these teeth same as of others.

Dr. STARK does not like to apply arsenic to the pulps of deciduous teeth when a large portion of the crown is absent; the difficulty of keeping it safely in place is too great. In such cases prefers the employment of very thinly mixed oxy-chloride of zinc, and finds this application efficient in the devitalization of the pulps. Applies it to aching teeth; pain soon relieved and death of pulp follows.

Dr. KEITH prefers to extract all badly decayed deciduous teeth, especially if they are painful or abscessed.

Dr. RICHMOND would retain the roots of deciduous teeth as long as was practicable, even when the crowns were wanting.

Dr. MATHIASON was in the habit of cutting away the crowns of deciduous teeth. Sometimes used nitric acid for devitalizing deciduous pulps.

Dr. SPALDING especially commended the views of Dr. Park relative to the excision of crowns. He had long followed the practice of freely excising deciduous crowns, and especially with a view to prevent decay of the permanent teeth. The sixth-year molars often required that kind of relief. He had not carried the method as far as Dr. Park had done, but believed it good practice to do so. He thought that a majority of the irregularity cases that came under our observation were caused by either the premature or the

too tardy extraction of the deciduous teeth; favored the filling of the roots of the first teeth, but thought it unnecessary to fill those having very small canals. He urged the importance of retaining the second deciduous molars until the second *permanent* molars had erupted. If the deciduous molars were prematurely lost, the sixth-year molars would be pushed forward by the incoming second molars, and thus the space between the right and left sixth-year molars of the same jaw would be lessened. Did not think that the early extraction of the deciduous teeth at all affected the development of the second set; but believed that the position of the sixth-year molars on the maxillary was frequently changed by the too early extraction of deciduous teeth.

Dr. FORBES dissented from the view that irregularities were caused by too early extraction of the deciduous teeth, but thought too long retention of these teeth often produced such a result. In case the sixth-year molar was pushed forward by the eruption of the second molar, he thought the second bicuspid has power enough to force the molars back into position.

Dr. KEITH did not think the second bicuspid entered the arch with sufficient force to effect such movement of the molars, and mentioned in evidence the fact that the bicuspids were frequently crowded out of line.

Dr. MCKELLOPS usually extracts deciduous teeth that are painful, believing that they were injurious to health. Prefers this course to giving them treatment.

Dr. NEWBY agreed with the last speaker, and practised accordingly.

Dr. Hall favored the treatment and preservation of deciduous teeth until in the order of nature they are replaced by the permanent organs.

J. G. HARPER, *Rec. Sec'y.*

INDIANA STATE DENTAL SOCIETY—EXTRACTS FROM ITS PROCEEDINGS.

At the twentieth annual meeting of the Indiana State Dental Society held at Indianapolis in June, 1878, the subject of dental education being under consideration, Dr. J. K. JAMESON said:

This is a subject in which the profession should all feel deeply interested. I do; I feel a great interest in this subject, from the

fact that I have felt the disadvantages of entering into practice before being fully qualified. At the time that I entered the profession (and my friend Dr. Taft knows something of that history) I commenced practicing dentistry before I was qualified, and I soon found out that I did not know anything about it, and I also found that I could learn a great deal from almost any man. The question is, how is a young man who intends entering the profession of dentistry to qualify himself for its successful practice. He looks to us for advice and counsel. A young man comes with the intention of studying dentistry, and asks what will be required of him; what is it going to cost, and how long is it going to take? I say we have the dental profession for that matter, to a great extent, in our own hands, and I think we should require a young man before we take him into the office at all, to have a good English education. We should tell him the length of time he would have to study, and the length of time he would have to practice before receiving any remuneration. There are men who will tell a young man that it is not necessary that he should attend a dental college. I tell a young man that it costs a good deal of time and money to qualify himself for the practice of dentistry, and if not thoroughly qualified, he practices at the expense of his patients. He should be required to work in a dental office at least two or three years, and then attend two courses of lectures in a dental college. If he cannot do this, I advise him to try some other occupation.

I am not favorable to the suggestion of establishing another dental college at Indianapolis, for the reason that it strikes me that we have too many colleges already. I received a circular, as I suppose every member of this society has, asking how many coleges there are, and asking how much I would contribute for the support of this college. I say we have dental colleges enough, and if the members of the profession in Indiana would contribute more for *their* support, say from fifteen to twenty dollars each per year, it would place those colleges on a better basis, and instead of having little colleges scattered all over the country, we would have a few good ones, and a few in which students could be thoroughly trained.

DR. HERRIOTT—I will briefly state that I consider at the present time that this matter of "dental improvement" is one of great importance, and one which, I think, should be carefully considered.

I myself think that it is high time that the State of Indiana should do something in the direction of a dental college. There is no doubt in my mind but that we have come to a point where this matter cannot be passed by lightly. The committee will have a report to make on this subject of "Dental Education" that will bring it properly before you. Perhaps there are some others here who would like to talk on this subject. May be Dr. Taft, who is one of the old dental educators of the State, would say something on this subject.

DR. TAFT:—I don't feel that I should detain this convention for any length of time on this subject because all the members of the society—all the active members, I mean—can talk more intelligibly on this subject than I can. I regard this as a subject of great importance, and I agree with Dr. Jameson, that the members of the dental profession are responsible in reference to this matter of "Dental Education," and also that they are responsible in reference to the education of those who are to enter the profession in the future. This is a subject which, heretofore, has not had the attention it should have had. In the Indiana State Dental Society, I suppose, there are four or five hundred members; three hundred of those may have received but very little teaching from any outside source. After hard study and practice they open an office, and by and by they want a young man for a student, or some one who can assist; then the dentist should insist that he take a thorough and proper course, and tell him what he has to do, in this matter; at the very beginning tell him what a dentist should understand thoroughly, and as well as possible what should be required, the course to take, etc., so that he can go into the profession and be an honor to it. The responsibility rests upon the teacher of thoroughly imbuing that student with what he is about to do. I would suggest one thing right here,—it is this: Young men should not be permitted to enter the profession before they are thoroughly competent. There have been too many already who have entered the profession before they were qualified; at least, I know there was one—I am sure of that; and Dr. Jameson thinks there was another; but this occurred at a time when there was more excuse for it than there is now; for now we have colleges abounding on all sides of us. Every man who intends to make a dentist of himself should have a good English education, and should understand a good deal

about the Greek, Latin, and French languages, because in the study of anatomy and physiology, there are a great many anatomical names and phrases which derive their origin from those languages, and no living man can learn them and retain them in his memory, without a knowledge of those languages.

Dr. Jameson said there would be too many colleges if every State had a dental college, and he thought we had better contribute more to a few colleges than to have so many. Now, I don't agree with the Doctor there. I think every State should have a dental college, and by that means they might induce a good many more to enter the schools and take a more thorough course, and become far better fitted for their profession. I am not sure that there are more dental colleges in the country than there should be, because the attendance at each of the dental colleges is as good as it was when there were only two or three in the country; and I think the more colleges there are the more will attend them.

DR. JAMESON: I don't wish to be understood as saying that I was afraid there would be too many colleges, but that I think it would be better to take the colleges we have now, and make them first-class institutions.

DR. KIRK: If our education is simply mechanical, it will be of very little importance. What we want is practical ability, and a good practical education cannot be had in any of the dental schools; but I think a good, thorough education in an office with a practical man brings the student in connection with all classes of work, and it is the best practice he can have; and after a student has spent two or three years in a good office he is then fitted to enter a dental college.

DR. WELLS: I would like to ask Dr. Taft if the dental colleges will admit students who have never received private pupilage?

DR. TAFT: Yes, they will.

AN ACT TO REGULATE THE PRACTICE OF DENTISTRY IN THE STATE OF INDIANA.

SEC. 1. *Be it enacted, by the General Assembly of the State of Indiana*, That it shall be unlawful for any one to practise dentistry for a fee or reward, in the State of Indiana, without having received a diploma from a Dental College, duly incorporated under the laws

of this or some other State of the United States, or a certificate of qualification, issued by a Board of Examiners to be appointed by the Indiana State Dental Association: *Provided*, That nothing in this act shall apply to any one engaged in the practice of dentistry in this State at the time of the passage of this act.

SEC. 2. A board of Examiners, consisting of five practicing dentists, shall be appointed by said State Dental Association, according to its by-laws, whose duty it shall be to meet annually at the time and place of meeting of the said State Association; or oftener, at the call of three members of said board, at such time and place as may be designated in said call, and to examine all applicants, and issue certificates to all who pass a satisfactory examination.

SEC. 3. Any applicant who furnishes satisfactory proof of having been engaged in a reputable practice of dentistry for ten consecutive years immediately preceding the time of their application, shall be examined only in practical dentistry—operative and mechanical; all others shall be examined in Anatomy, Physiology, Pathology, Therapeutics, Chemistry, and the theory and practice of surgical and mechanical dentistry.

SEC. 4. All certificates issued under the provisions of this act shall be signed by all the members of said Board of Examiners, and have the seal of the Indiana State Dental Association affixed, and shall be prima facie evidence of the right of the holder to practice under this act, which right it shall be incumbent on the holder to prove in all prosecutions under the same.

SEC. 5. Any member of the Board of Examiners may grant a permit to practice until the next meeting of the board, but such permit shall be valid only until said next meeting, and in no case be extended or renewed.

SEC. 6. Any person violating the provisions of this act shall be liable to prosecution, upon complaint of any citizen of this State, before a Justice of the Peace, or in any Superior Court of record, by indictment or information, in the county where the offense is committed; and upon conviction, shall be fined in any sum not less than fifty nor more than one hundred dollars for each offense: *Provided*, Nothing in this act shall be so construed as to prevent physicians or surgeons extracting teeth; and all fines so collected shall belong to the common school fund of the county where assessed.

SEC. 7. To provide a fund to carry out and enforce the provisions of this act, the Board of Examiners shall, before examination, collect from each applicant, the sum of twenty-five dollars; any portion of which there may be remaining after paying necessary expenses attending such examination shall be paid into the treasury of the said State Association, to be used for the purpose for which said fund is hereby created.

SEC. 8. Three members of the Board of Examiners shall constitute a quorum, and all questions before them shall be decided by a vote of the majority of those present; and should there not be a quorum present on the day of meeting, those present may meet and adjourn from day to day, until there is a quorum present.

SEC. 9. The board shall receive, out of the fund created by this act, such compensation for their services as the by-laws of said State Dental Association may provide.

SEC. 10. This act shall be in force from and after its passage, publication, and circulation in the several counties of the State.

The above act is now in force.—[ED.

COMPOUND HARE-LIP.

PROCEEDINGS OF THE NEW YORK ACADEMY OF MEDCINE.

DR. JAMES L. LITTLE presented three cases of compound hare-lip with cleft palate. The patients were three brothers, aged 22, 18, and 9 years. The father was born in England, the mother was a native of the United States. No deformity could be traced upon either side. The family consisted of nine children, who were born as follows: First, a boy, with compound hare-lip and cleft palate. Second, a girl, without deformity. Third, a boy, with compound hare-lip and cleft palate. Fourth and fifth, two girls, without deformity. Sixth, a boy with compound hare-lip and cleft palate. Seventh and eighth, two girls without deformity. Ninth, a boy, who lived only a few hours, but was born with compound hare-lip and cleft palate. Four boys and five girls; all the boys born with deformity, and all the girls without deformity.

The only external deformity in the family, aside from the hare-lip, was absence of the ring finger, and a peculiar twisting of the little finger, on the right hand of John Bocock, which gave it somewhat the appearance of a thumb. The index and middle fingers

were also larger and longer than corresponding fingers upon the left hand.

On Wm. Bocock, æt. 22 years, four operations were performed. His lip before the operation had a wide cleft, the intermaxillary bone projected and held one incisor tooth, and there was fissure of the hard palate. The first operation was to close the fissure in the hard palate, and was only partially successful; the soft palate separated entirely, and the covering for the fissure in the hard palate almost entirely.

The second operation consisted in removing the projecting portion of the intermaxillary bone, and forming a septum for the nose with the integument by which it was covered. The operation was successful. Subsequently, an operation was performed upon the double hare-lip. That operation was followed by an attack of erysipelas, and was only partially successful.

Lastly, what is known as Nelaton's operation was performed, and the result was very satisfactory.

On John Bocock, æt. 9 years, two operations were performed. The intermaxillary bone projected and carried two incisor teeth. A septum was formed for the nose in the same manner as in the first case, and the operation was successful. Subsequently an operation was performed upon the double hare-lip, and the result was very satisfactory.

Chas. Bocock, æt. 18 years, had a very wide cleft in the mouth, but the projection of the intermaxillary bone was not so prominent as in either of the other cases. Dr. Little proposed to operate after the same general plan by which he had been guided in his operations upon the other patients.

Dr. POST exhibited a *daguerreotype* of a patient thirteen years old, on whom he had operated for the correction of a deformity that equalled the worst features of any case which Dr. Little had presented. The result was such that no indentation was left in the margin of the lip. He thought it very important to make the incisions so that when the edges were brought together there would be considerable pouting at the junction on the margin of the lip. There was no danger of bringing too much material to that point.

Again, operations performed upon adults or half grown children were usually followed by better results than in small children. The parts could be brought into more perfect apposition, etc., still, it

was not desirable to allow children to grow up with such a deformity. In cases in which there was fissure in the bony structure, early closure of the fissure in the lip exercised a certain amount of pressure, and diminished the breadth of the cleft in the hard palate.

Dr. WM. T. WHITE referred to a family in which three of the chil were born with hare-lip and fissure of the palate. All died within a few days after birth.

DR. POST referred to a family reported by Dr. Buck, in which the mother and five or six children had hare-lip.

Dr. GARRISH referred to four families in which there were three children in each family who had hare lip, either compound or simple.

Dr. WEINER referred to a family in which two children born of the first wife had compound hare-lip, but in none of the children born of the second wife did the deformity appear.

He thought it was next to impossible to secure such perfect coaption of the parts at the first operation as would entirely correct the deformity. He had never seen a case in young children in which it was not necessary, after the child reached ten or twelve years of age, to operate to remedy the indentation in the margin of the lip.

With reference to closing the fissure in the hard palate, he thought an operation should be avoided, because the dentists had succeeded so well in making an artificial roof of the mouth, and at the same time the operation was quite commonly unsuccessful.

Dr. LITTLE thought if the operation could be performed, it was usually successful, and believed it to be bad advice to send such patients to the dentists. There were comparatively few patients who could bear the expense of the artificial appliance. In order to secure the best results so far as indentation in the margin of the lip was concerned, he thought it very important to secure perfect coaption at the *upper* edge of the vermilion border.

Dr. WEINER referred to a case in which an opening in the hard palate about three-fourths of an inch in diameter was successfully closed by a button made of gutta-percha. The girl had learned to mould one herself, and made a new button as often as the old one became hard and gave her any discomfort. An artificial appliance was thus afforded which answered all practical purposes, and the expense was a mere trifle.

Dr. POST thought it well confirmed that a properly formed artificial palate was more useful than a united velum, and was preferable if the patient could bear the expense.—*Medical Record.*

THE PROGRESS OF DENTISTRY IN ENGLAND.

At the meeting of the Odontological Society in London, March 3d, as reported in the "Review of Dental Surgery," Mr. A—— B—— asked "whether, in the case of two contiguous teeth—the cavities being large—it was desirable to make two stoppings, so as to get an interval between the teeth, or only one stopping common to the two teeth." It is satisfactory to know that the President thought it not wise to make one stopping rest on two teeth.

MISCELLANY.

A CASE OF COMPOUND DEPRESSED FRACTURE OF THE SKULL, IN WHICH THE DURA MATER WAS SUTURED WITH CARBOLIZED CATGUT AFTER REMOVAL OF THE DEPRESSED BONE. THYMOL DRESSING. RECOVERY.

BY W. T. BULL, M. D., SURGEON TO CHAMBERS STREET HOSPITAL.

Michael Quinlan, a carpenter, 21 years old, in vigorous health, was struck on the head on July 15th, 1878, by a jack-plane, which fell from a height of three stories. He was unconscious for a few minutes, and was brought to the hospital in a carriage, suffering from dull pain in the head, but with pupils, pulse and respiration normal. Examination revealed a compound depressed fracture of the right parietal bone. The fractured portion was just behind the fronto-parietal suture, three quarters of an inch to the right of the median line, and was triangular in shape (one inch long on each side), one angle being driven downwards fully three-quarters of an inch. The scalp wound was two and a half inches long and curvilinear in form. Compresses, wet in thymol (1 to 1000), and an ice-bag were applied to the head.

Eight hours later the patient was etherized, and under thymol spray two pieces of the external table (about one-half inch square), and several smaller fragments of the internal table, were removed with the elevator and bone forceps. One or two spiculæ were removed from the brain substance through an L-shaped rent, one-half inch long in one direction, an inch and a half in the other. There was no serious laceration of the brain, but its exposed surface was ecchymosed and contused. The rent in the dura

mater was closed with a continuous suture of carbolized catgut (the smallest size), the scalp wound united with silk sutures, drainage tubes inserted, and a dressing of thymolized gauze applied.

On the day after operation the evening pulse was 80 and temperature 38.9°, and the patient had frontal headache and photophobia. Up to the eleventh day his condition was satisfactory, the pulse remaining below 86, and soft; the temperature below 37.8°. The dressing was changed four times, the discharge being slight in quantity, free from odor, and not purulent till the eighth day. On the twelfth day there was violent headache, vomiting and delirium, during which the dressing was torn off; pulse was 64, temperature 38.4° in the morning; pulse 80, temperature 38.9° in the evening. The scalp wound, which had united, was opened; the dura mater found to be covered with grayish exudation; a hypodermic syringe and an exploring needle, thrust to the depth of one inch, did not discover pus; there was no trace of the catgut. The dressing was replaced by compresses wet in thymol, an ice-bag was applied to the head, a blister to the nape of the neck, and potassic bromide administered—1.33 grams every three or four hours. (The bowels had been kept open by occasional doses of calomel.) Within a week the bad symptoms disappeared. The wound granulated rapidly, and closed entirely in six weeks, and the patient was out of bed. Three months from the date of the injury he reported at the hospital, and the following note was made: "One or two little pieces of bone came away during last month. The sinuses are now closed. Has had occasional headache after unusual exertion, but feels perfectly well, and is doing light work."

We certainly need no further testimony to the value of carbolized catgut in surgical practice, but its use in this ususual locality has seemed to me to render the case worthy of mention. It was suggested to me by a similar case which I saw in the wards of Prof. Bardeleben in Berlin in 1872. Both the fracture and the laceration of dura mater were much more extensive, and were situated in the right fronto-parietal region, and the patient made a good recovery. —*Archives of Med.*

PRACTICE OF NERVE STRETCHING.

Dr. E. Masing, of St. Petersburg, reports in the "St. Petersburger MedicinischeWochenschrift," No. 54, 1878, two cases treated by exposure and stretching of nerve trunks.

The subject of the first case was a male, aged 37, who had for eight years suffered much from neuralgic pains in the lower limbs. The attacks commenced near the antero-superior spine of the left ilium shortly after the man had been exposed during one night to cold and wet. In spite of frequent and varied treatment, the pains gradually increased in intensity and extent, and finally radiated along both extremities. Between five and six years after the commencement of this affection, the muscles moving the right foot became paralyzed, and soon afterwards those of the left foot. During the last year there had been slowly developing anæsthesia along the posterior surfaces of both lower limbs. The patient, when first seen by Dr. Masing, was mentally depressed, pale and emaciated. He was easy only when sitting with the lower limbs up to the hips enwrapped in woollen material. Intense pain was caused by any movement, by exposure of the lower limbs to cold air, and by the recumbent posture. The pain commenced near the left ilium and from thence extended to the lower limbs. No objective morbid sign could be made out at the starting-point of the pain; there was no subcutaneous infiltration or peritoneal thickening. The pulse was normal. The lower limbs were wasted and the feet and limbs cool. There was almost total anæsthesia of the skin over the ischiatic region, along the posterior surface of each thigh, and over the whole of each leg and foot except in the portions along the inner surface supplied by the long saphenous nerve. All the muscles of both legs and feet were paralyzed, those of the thighs, supplied by the anterior causal and obturator nerves, were not thus affected. There was occasionally involuntary discharge of stools, and micturition was much impaired.

On September 15th, the patient having been placed under the influence of chloroform, a vertical incision 10 centimetres in length was made from the fold of the buttock downwards along the posterior surface of the left thigh. The sciatic nerve, which appeared to be quite healthy, having been exposed and isolated, was then forcibly extended. At the same sitting a similar operation was per-

formed on the right side. The proceedings occupied about twenty minutes, and were carried out under antiseptic conditions. For some hours after the operation the patient suffered most severely from radiating pains in the region of the left hip. On the following morning he was easy and could lie down without trouble. On the fourth day he suffered much from pains over nearly the whole body, and especially in those parts of the legs and feet which before the operation had been anæsthetic. On the fifth and sixth days there was but little pain. On the seventh day he suffered much from burning sensations along the course of the left long saphenous nerve. On November 3d there was marked improvement, and pains radiating from the left iliac region had been much relieved, and the man was now able to move the muscles of the legs and feet. The main trouble at this time was severe burning pain in the left anterior crural nerve and along the left saphenous nerve as far as the knee. On November 8th the left anterior crural nerve was exposed and stretched. The operation was soon followed by much improvement in the general condition of the patient. On April 7th of the present year the man was in good health, able to walk well, and quite free from pain and from anæsthesia.

The subject of the second case was a boy, aged 12 years, whose left foot had been injured through a fall. The injury had resulted primarily in swelling of the extremity, with much tenderness, and subsequently in persistent spasm of the muscles of the left leg. When the patient was first seen by Dr. Masing, the left foot presented a condition of extreme equino-varus, all the toes being bent at right angles to the dorsum. The muscles of the left leg were in a tetanic condition. Active movements at the joints of the distorted foot were completely abolished, and attempts at passive motion were attended with much pain. There was hyperæsthesia of the skin of the foot and leg, and also very marked tenderness over the trunk of the sciatic nerve in the thigh, and along the three great branches of this nerve in the leg. Locomotion was prevented through pain. During sleep the foot became lax and as mobile as the opposite extremity. The contraction and distortion recurred at the moment the lad was aroused. Dr. Masing diagnosed the case as one of neuritis of the sciatic nerve, commencing as a result of the injury to the foot in the perineal and two tibial nerves and invading gradually the main trunk. The healthy condition of the

ham-string muscles indicated that but part of the sciatic nerve was affected, and the unilateral extent of the morbid condition, the preservation of the normal innervation of the bladder, and of all portions of the body supplied by the lumbar plexus, led to the conclusion that the spinal cord and its membranes remained in a healthy state. On January 16th, after other plans of treatment had been tried without any success, the left sciatic nerve was exposed and stretched. This operation was followed on the next day by contractions over the whole of the left lower limb, and by forcible flexion at the knee. The hyperæsthesia of the leg still persisted. On the third day the patient suffered much from chronic spasm of the muscles of the left leg. During the first week in February no improvement having taken place previously in the condition of the limb, there were frequent paroxysms of violent clonic spasm, the leg becoming very much flexed. At this time the hyperæsthesia had extended beyond the region of the leg and passed to the left thigh, and to the left sides of the pelvis, abdomen and thorax. From February 6th, when the patient was first treated by frequently repeated subcutaneous injection of morphia, there was a temporary improvement, and in the course of one week all the more severe symptoms had disappeared. At the end of a fortnight, however, after the cessation of this treatment in consequence of dyspepsia, loss of appetite, and headache, all the patient's troubles returned. Towards the end of May some improvement was noted after continuous blistering of the spine in the lumbar and sacral regions. The pain was then much relieved, and the patient was able to go about on crutches. The paroxysms of clonic spsam were much less frequent and less severe, but distortion of the foot and friable flexion at the knee still persisted.

The patient was again seen after an interval of three months, on August 16th, and his condition had then much improved. He was able to extend the left leg so as to touch the ground with the toes, and could walk without crutches. There was still much hyperæsthesia. The lad's general condition was very satisfactory.

Dr. Masing, in some remarks on this case, states that there w s much obscurity as to its precise nature. The symptoms, he holds, contra-indicated any central lesion and pointed rather to a reflex neurosis. The nerves about the left ankle had probably been torn and contused in the injury to this joint, and a centripetally spreading

neurosis had resulted. The disturbances set up after the operation in the regions supplied by the anterior crural, lumbar and intercostal nerves were, it is supposed, purely reflex, since neither atropy nor paralysis could be observed in the affected parts.—[*London Med. Record, Jan.* 15, 1879.

EVAPORATION OF WATER IN HOT-AIR FURNACES.

Certain newspaper writers have lately revived the old idea that hot air furnaces "dry the air," and that this should be remedied by the evaporation of water in connection with the heating apparatus. The absurdity of this notion was pointed out in the "Journal" years ago, but for the benefit of the many readers who have since been added to our *clientèle*, as well as for the sake of bringing out some facts not presented in former articles, we recur to the subject now.

The theory of those who urge the necessity of evaporating water in furnaces may be briefly stated thus: A comfortable temperature in summer is, say, 70° F., with 70 per cent. of moisture in the air—that is, 70 per cent. of the amount required to *saturate* the air at the given temperature. In winter, with the thermometer at 32°, the air holds but a small fraction of this amount of moisture; and if heated up to 70° it will contain only from 15 to 20 per cent. instead of 70 per cent. The difference, it is said, should be supplied by artificial means.

The premises are not to be disputed; but the conclusion is an arbitrary and ridiculous one. It does not follow logically, and it cannot be carried out practically.

In the first place, though 70° of temperature with 70 per cent. of humidity is comfortable in summer, it does not follow that the same degree of moisture is necessary for comfort in winter, with the same temperature. Experience teaches us the contrary. If the air is pure, the deficiency of moisture is not felt to be an inconvenience. We are not aware that any writer on the subject has taken the ground that water should be evaporated in rooms heated by open fire-places; yet the hygrometric condition of the air is essentially the same in such rooms as in those *properly* heated by hot-air furnaces. The current of air constantly passing up the chimney is supplied by air from out of doors, which finds entrance through the

crevices of doors and windows and walls, if no special openings for its admission are provided. In the case of the furnace a current of air from without is continually pouring in through the register, and an equal volume must find its way out by indirect channels if no direct ones are furnished. In both cases, if the mercury is at the freezing point outside, the air that comes in is equally dry; and when heated, whether by the furnace or the fire-place, its capacity for moisture is greatly increased. If it is uncomfortable or unhealthy in the one case, it ought, other things being equal, to be so in the other; if moisture should be supplied artificially in the room heated by a furnace, it should be in that heated by a fire-place.

"Other things being equal," we have said; but if there *is* a difference in the two cases—if, with the fire-place, the air is grateful to the lungs, while with the furnace it is oppressive—other things are *not* equal. There must then be some other fault with the furnace-heated air than lack of moisture; and what is it? Probably the air is more or less poisoned in passing through the furnace—contaminated with noxious gases from the burning fuel, which escape through joints or cracks, or through the cast-iron, if that is the material of which the walls are made.

Another common cause of impurity in the air from furnaces, and one which, so far as we know, has not before been pointed out, is by leakage from the cellar. We take it for granted that no reader of the *Journal* draws the supply of cold air directly from the cellar, as is often done; but few are aware how seldom the cold-air box is even approximately air-tight. A simple experiment will serve to show whether it leaks or not. Burn a little sulphur in the cellar (a dozen or two friction matches may be used), and note whether the odor is perceptible at the registers above. A little tobacco smoke will answer the same purpose. In many cases the evidence that the air of the cellar is drawn into the air-box and mixed with the current from out of doors will be instantaneous. We are satisfied, indeed, that sometimes the "coal-gas" in the house enters in this way, and not directly from the fire-pot. From some disarrangement of dampers, or other cause, the gas escapes into the cellar, and passes from the cellar into the air-box. It is hardly necessary to say that cellar air, at the best, is not desirable, even as a partial supply for rooms above; and when contaminated, as it is liable to be, it may be bad enough to suggest to the most obtuse that "something is the matter with it."

If the furnace is properly constructed and is in perfect order, and if the supply of air is absolutely pure, the atmosphere of the house should be as sweet and wholesome as if heated by open grates or fireplaces. No artificial addition of watery vapor will be needed in the one case more than in the other.

It has been said above that it is not only unnecessary but impracticable to furnish moisture enough to bring the heated air up to the standard of 70 per cent. It must be borne in mind that to evaporate water requires heat, and that the heat thus used becomes latent in the vapor, and is not available for raising the temperature of the air. Now it is possible to calculate how much heat it will take to supply a given amount of moisture in the air. If the outer air is just at the freezing point, and if it has its average moisture, almost as much heat will have to be expended in vaporizing water enough to bring it up to the desired point of 70 per cent. of humidity as to raise it to 70° of temperature. To be exact, the amounts will be as 638 to 670—that is, for every 670 pounds of coal used for heating, 638 pounds must be used for evaporation. If the temperature outside is 35°, the numbers will be 611 and 617, differing by less than one per cent.

To carry out this foolish notion of raising the heated winter air to the summer or "healthful" standard of humidity would, then, double our coal-bills; but even this would not suffice. The tendency of the aqueous vapor in the heated air to diffuse itself is so great that this degree of moisture could not be maintained consistently with proper ventilation, if indeed it were possible at all, in any house of ordinary construction. Our watery vapor would be costly to get, and "like a vapor" it would pass away before we could fairly say that we had got it.

The subject is continued in the next number of the JOURNAL, as follows:—[ED.

WATER FOR HOT AIR FURNACES.

Our reference to this subject last month has called forth sundry communications from friends and readers, some confirming and some questioning the views then expressed. One gentleman who states that he has had a Nichols furnace for several years, and has never used any water or felt the need of any, is nevertheless puzzled by the assertion "that with the *same* temperature, we need less moisture in winter than in summer," and asks how that can be possi-

ble. That is a point to which we intended to recur in a future article, and we will barely allude to it here. Has our friend considered how differently we are *clothed* in winter and in summer? With a temperature of 70° and 70 per cent. of moisture in the air, as in summer, our thick winter clothing would be intolerable; but we do not find it so in the dry warm air of our furnace heated houses in winter; on the contrary, we need it at the latter season, because of the difference in the humidity of the air

Another correspondent, a physician, puts the following questions:

First—Why is it that furniture becomes unglued, and that all the woodwork shrinks much more in rooms heated by furnaces than in such as have open fire-places or even stoves?

Secondly—How do you account for the fact that several members of our family, including myself, are made aware that all the water is out of the furnace by a disagreeable sensation of tightness about the head and parching of the skin?

We were careful to say that the hygrometric condition of the air in rooms heated by open fires was essentially the same as in those "*properly* heated by hot-air furnaces"—the italics being in the original statement - *not* in those *improperly* so heated. The latter is unfortunately the rule, the former the exception. How will our friend account for the fact that in a certain house we happen to know of, where a part of the rooms are heated by open fires and a part by a hot air furnace in which no water has been evaporated for the past seven years, there is apparently no more drying or shrinking of furniture and woodwork in one set of rooms than in the other? In neither has there been the slightest perceptible injury of the sort. The best seasoned wood will absorb moisture and expand somewhat in the dog-days, but when fires begin to be made in the fall, the wood soon returns to its normal condition. It is noticeable, however, in the house in question, that this does not occur any more promptly in the furnace-heated rooms than in the others. This is no exceptional case, so far as the action of furnace heat is concerned; we know of scores of houses in which no such shrinking of furniture and woodwork ever takes place.

Much the same reply may be made to the second question. In the house mentioned above no such disagreeable sensations as our friend describes are felt in any room. We venture to say that his

furnace has not a fire-brick lining; and there would seem to be some ground for the opinion, that with such villainous apparatus the evaporation of water affords a sort of imperfect relief to lungs condemned to breathe the overheated air. But such furnaces are not fit to be used in any civilized habitation, and just to what degree the mischief they do may or may not be mitigated by one device or another, we do not care to inquire. Certain necessary evils we may endeavor to palliate and make the best of, but with those that are as unnecessary as they are flagrant no compromise should be allowed. What we have said of houses *properly* heated by furnaces, we know to be true; of those *improperly* heated our friend has indirectly given some idea. We leave our readers to draw their own "moral" from the two pictures, though, as we have said, certain bearings of the subject may be considered at another time.—[*Jour. of Chemistry.*

SOME ANATOMICAL PECULIARITIES IN THE MALE CHIMPANZEE.

The body of the male chimpanzee, which recently died at the Philadelphia Zoological Gardens, was immediately removed to the Medical Department of the University of Pennsylvania, where Dr. Joseph Leidy, Professor of anatomy, has been gradually dissecting it. Dr. Leidy has already dissected the bowels, lungs and brain of the animal, which has enabled him to develop certain facts in the anatomy of the chimpanzee not hitherto known. There were in some respects several marked differences between the brain of the female chimpanzee, which was dissected in Philadelphia some weeks since by Dr. H. C. Chapman, and that of the male now dissecting by Dr. Leidy.

Dr. Chapman reported, in his paper on the subject, read at a late meeting of the Philadelphia Academy of the Natural Sciences, that the brain of the animal under his examination closely resembled that of a human being, with the exception of the fact that the cerebrum did not cover the cerebellum. This statement coincides with that of a distinguished anatomist whose dissection of the body of a chimpanzee, many years ago, is one of the few cases on record. Dr. Leidy, on the other hand, found that in the case of the male chimpanzee, the cerebellum is covered by the cerebrum, so rendering

the resemblance anatomically exact between its brain and that of man, and at the same time showing that the intellect of the male chimpanzee is greater than that of the female. From this fact the inference may readily be drawn that the present is the only case on record in which an anatomical examination of a male chimpanzee has been made.

Another striking difference in the anatomy of the male and female chimpanzee is a most remarkable perculiarity in the formation of the vocal organs. This peculiarity consists in the possession on the part of the male chimpanzee of a natural bagpipe, which communicates with the larynx and extends into the chest and armpit. This bag is covered by powerful muscles. To produce a loud sound by means of this bag but a slight motion of the arms is necessary. When Dr. Leidy discovered this bagpipe he at once wrote to the superintendent of the zoological gardens to inquire if the male chimpanzee had any distinctive call or cry. In reply he received answer that the "voice of the male, for so young an animal, was simply enormous; and that its cry, when enraged, was loud, piercing and shrill." It is a well known fact that this physical arrangement is found in the male gorilla, in the orang-outang, and in the howling monkeys of Southern Africa, whose cry can be heard for miles.

The body of the animal will be preserved and placed in the medical museum of the university. Dr. Leidy will shortly incorporate the result of his examinations in a paper to be presented to the Philadelphia Academy of Natural Sciences.—*Scientific American.*

CORRESPONDENCE.

Editor Missouri Dental Journal:

Your last issue contains a note from Prof. H. S. Chase, indirectly advising dentists to take out licenses from the Goodyear Dental Vulcanite Co., and claiming that the late decision of Judge Wheeler, in the "Preterre case," covered the use of celluloid as well as vulcanite.

From this conclusion, the Celluloid Manufacturing Company most earnestly dissent. In a circular, which the Celluloid Co. have recently issued, they say:

"Judge Wheeler, in fact, says, that, upon a state of facts, such as was shown in the Davis case, he would have adopted Judge Shepley's conclusions." They

further add that, in case the Goodyear Dent. Vulc. Co. "have the hardihood to bring suit against any dentist, to restrain his use of our base, all that will be necessary for the dentist to do, will be to promptly forward to us any paper served upon him, and put the conduct of his case in our hands from the first, in which case we will defend him at our own expense."

Knowing that the JOURNAL is entirely impartial, and always ready to present both sides of a disputed case, I ask the publication of this note, that your readers may be put in possession of all the facts and decisions bearing upon the Cummings patent.

J. F. S.

BOOK NOTICES.

WOOD'S LIBRARY OF STANDARD MEDICAL AUTHORS. Wm. Wood & Co.: New York.

The last two numbers of this series comprise Vols. I. and II. of Frerich's Clinical Treatise on Diseases of the Liver. The character and appearance of the volumes improve, as the series progresses. and the publishers are doing more than was promised in their prospectus of this work. The present treatise on the Diseases of the Liver is divided into three volumes, and the two already out are handsomely illustrated with colored plates, and contain chapters on the Relative Size and Weight of the Liver in Health and Disease; The Diagnostic Value of its Size and Forms in Morbid Condition, Jaundice, Acholia, Chronic Atrophy, Fatty Liver, The Pigment Liver; Hyperæmia of the Liver and its Consequences; Hepatitis, its Forms and Consequences; The Waxy Lardaceous and Amyloid Degeneration of the Liver, and Hypertrophy of the Liver.

The subscriber to Wood's Library of Standard Medical Authors will get in these volumes the benefit of Frerich's own views, as given in his original monograph, as well as numerous notes by the translator, Dr. Murchison. This fact renders the present work of unusual value, both the author and translator being men of distinguished reputation as students of the functions and pathology of the liver.

AMERICAN HEALTH PRIMERS, Edited by W. W. Keen, M. D. The dissemination of accurate scientific knowledge concerning the common affairs of life, is a prominent feature of the present time, This is constantly being done through the press and by means of public lectures. Some of the most eminent scientists living, have

imposed upon themselves the task of simplifying the teaching of the sciences, by the use of terms and comparisons, that are readily comprehended by the common people. A substantial love for the study of the sciences is thus begotten in their minds which amounts to something more than an idle curiosity. A more wide-spread and far-reaching work is being done by the press; and notably, in the issue of a class of small books called scientific primers. Belonging to this class is the series of health primers of which we are now speaking. The series so far as announced comprises eleven volumes, and the subjects to which they relate are as follows:

1. Hearing, and How to Keep It.
2. Long Life, and How to Reach It.
3. Sea Air and Sea Bathing.
4. The Summer and its Diseases.
5. Eyesight, and How to care for It.
6. The Throat and the Voice.
7. The Winter and its Dangers.
8. The Mouth and the Teeth.
9. Our Homes.
10. The Skin in Health and Disease.
11. Brain Work and Overwork.

These little volumes are written by Americans, and being designed chiefly for American readers, have been prepared with reference to the climate of this country, and to American modes of life.

Other volumes are in preparation including the following subjects: "Preventable Diseases," "Accidents and Emergences," "Towns We Live In," "Diet in Health and Disease," "The Art of Nursing," "School and Industrial Hygiene," "Mental Hygiene," etc., etc. They will be 16mo. in size, neatly printed on tinted paper, and bound in paper covers. Price 30 cents; flexible cloth, 50 cents.

LINDSAY & BLAKISTON, Publishers.

THE SCIENTIFIC AMERICAN (weekly), $3.20 a year. Mann & Co.: New York. Devoted to the Industrial Sciences, Manufactures, etc. There is so much of Art, Chemistry, and Mechanics in the profession of dentistry that one can scarcely afford to do without some such paper as the Scientific American, in order that he may be kept fully advised of the progress the world is making in the directions indicated above. Every weekly number contains matter of value to the intelligent practitioners of our art.

CIRCULAR OF INFORMATION OF BUREAU OF EDUCATION, Washington, D. C.

RHYMES OF SCIENCE. Wise and Otherwise. Industrial Publication Co.: New York. Amusing, peculiar, and instructive.

THE POPULAR SCIENCE MONTHLY comes to us laden with its usual store of scientific articles. No lover of the useful and the true will ever regret the expenditure of the five dollars a year, or fifty cents a number, which is the price of this excellent magazine.

EDITORIAL.

The annual volume of Transactions of the American Dental Association, has come to hand. The deferring of the publication of this volume for a half year or more after the adjournment of the meeting of the Association, seems to have grown into a custom which nothing but a strong effort will be likely to disturb. That any necessity exists for so long withholding from the profession the many excellent papers, and the valuable discussions which the volume contains, will scarcely be claimed. If it is practicable that the work should be completed at an earlier day (and we insist that it is), why can not it be done? Several of the papers printed in this volume have been published in one of our dental journals months ago, and the tardiness with which the full volume has appeared affords a tolerable excuse for this deviation from previous usage. Indeed, it is questionable if the practice of issuing an annual volume might not be advantageously transferred to the periodicals. If the publication of a portion of the papers read is to be anticipated by the journals, why not give them the entire contents of the volume? Certain it is that the Association must establish *some* rule governing the disposition of its papers, and whenever such rule is established it will no doubt be cheerfully complied with.

The work has been executed in a creditable manner, though not quite free from typographical errors; and it is to be regretted that the book could not have received a better binding than that with which it is clothed. We notice that two of the papers read at the meeting have been omitted, and that some telling points in the discussions do not appear. It is to be presumed that the publication committee acted according to their best judgment in deciding what should be admitted; yet others might differ with them in opinion.

A list of the officers of the Association, from its organization, is given, from which it appears that so far as the presiding officer is

concerned the honors have been rather widely distributed. Of the nineteen persons who have filled the office of President, Illinois has furnished three; Ohio, five; New York, three; Pennsylvania, two; Missouri, three; Massachusetts, Tennessee and Indiana each, one. The place of Recording Secretary has been filled eight times by a resident of Ohio; ten times by residents of Illinois, and once by a Missourian. Inasmuch as the successful working of the Association is largely dependent upon the efficient labors of the two officers named above, fitness for the office, rather than locality, should be considered in the selection of the incumbents.

AN APPEAL.—The unfortunate occurrence which recently took place in San Francisco, and which resulted in the death of Josiah Bacon, Esq., has attracted the attention of the profession throughout the country. Dr. Chalfant asserts that the killing was not intentional; but whether it was intentional or accidental, the present situation of this gentleman is terrible indeed. That he should have a fair trial and be well defended in the courts, is no doubt the sentiment of every member of the dental profession. Dr. C. is said not to be able to employ counsel who can successfully cope with that which will appear in behalf of Mr. Bacon's friends.

The feeling in San Francisco is, that the profession at large should aid in securing to Dr. C. the best defense that can possibly be made, and to that end that each should contribute such sum as he can individually afford.

We have received an appeal for aid in this case, signed by twelve San Francisco dentists, urging that every one should contribute according to his means. A small sum from each of a large number would bring together an amount sufficient to secure an adequate defense.

It is proposed that contributions from the Eastern States be sent to S. S. White, Philadelphia, to be held by him subject to the order of an authorized agent at San Francisco; and that contributors in the West may, if they prefer, remit to J. H. A. Folkers' dental depot at San Francisco.

QUALIFICATIONS FOR GRADUATION.—One of the most obvious wants of the system of dental education, as at present constituted, is the lack of a uniform standard of qualifications requisite for graduation. Each college has its own rules

and regulations, and among them are its rules governing the examination of its candidates for graduation. The rules adopted may be as various as the schools are numerous; and it is altogether uncertain how many rules are in force upon which all the colleges precisely agree.

Efforts have been made to bring about some degree of uniformity, but with little success. Competition, even rivalry, exists between different colleges; and this sentiment constitutes an impediment to an agreement between the schools. It seems to us, however, that so far as the qualifications for graduation are concerned, the colleges ought to come to a definite understanding. If they cannot do this for themselves, let it be done, with their co-operation, by the American Dental Associations.

Suppose, for instance, that the general body should appoint an examining committee, to consist of, say twenty-one members. Let this committee be properly distributed over the country, regard being had in their selection to convenience of access to the different colleges. Let five members of this committee, or a less number, constitute a quorum for the examination of candidates. Provide that the college visited by a sub-committee shall have one representative on this sub-committee. The entire committee shall frame a schedule of requirements which shall govern the sub-committee in all their labors, and each sub-committee shall report its doings to the general chairman. Whatever standard the whole committe may fix shall first be submitted to the association for approval, and that body shall deny representation to any college that fails to conform.

IN MEMORIAM.

ST. LOUIS, March 21, 1879.—At a special meeting of the St. Louis Dental Society, held at the office of Dr. Fuller, the following resolutions were adopted:

WHEREAS, In his dispensation of Providence, it has pleased our Heavenly Father to remove by death, our former associate and co-laborer, Dr. Edward Hale, Sr.; and

WHEREAS, It is proper and becoming in a body, with which for a number of years he was intimately associated, to pay proper respect to his memory; and,

WHEREAS, His conduct professionally has ever been worthy of imitation, he having ever led a pure and Christian life characterized by a high moral and religious tone; therefore,

Resolved, That we sympathize with the family and friends of the deceased.

Resolved, That as an expression of the respect we bear his memory this society attend his funeral in a body; and,

Resolved, That these resolutions be entered upon the records of the society, and a copy be furnished by the secretary, to the breaved family.

Dr. Hale was for many years a leading practitioner in this city; and resided at Orange, N. J., from the time of his removal from St. Louis until death.

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